FIRST ANNUAL REPORT

OF THE

NEW JERSEY

State Board of Agriculture,

TO WHICH ARE PREFIXED

THE LAW BY WHICH IT IS ESTABLISHED, THE BY-LAWS, THE PLAN OF WORK ADOPTED, AND THE LIST OF OFFICERS.

TRENTON, N. J.:
THE STATE GAZETTE—MURPHY & BECHTEL, BOOK AND JOB PRINTERS.

1874.

OFFICERS OF THE BOARD.

PRESIDENT:

His Excellency, JOEL PARKER, Governor of New Jersey.

SECRETARY:

Prof. GEORGE H. COOK, LL. D.

EXECUTIVE COMMITTEE:

WILLIAM M. FORCE, Esq., *Chairman.*

HENRY K. HOW, Esq.,

PROF. GEO. W. ATHERTON,

P. T. QUINN, Esq.

PROF. GEORGE H. COOK, *Secretary.*

THE NEW JERSEY STATE BOARD OF AGRICULTURE

Is organized under Chapter DXLVI. of the laws of 1872, of which the following is a copy:

AN ACT TO ORGANIZE AND ESTABLISH A STATE BOARD OF AGRICULTURE.

WHEREAS, The National Agricultural Convention, at its late meeting in Washington, in taking action for the promotion of agricultural interests, resolved that the several states in which boards of agriculture do not now exist, be requested to organize such boards by legislative action; *and whereas*, such a board, in the proper exercise of its functions, would become the centre about which to collect the results of successful farming, and from which to send out digested information in regard to the great questions of farm economy, tillage, crops, stock, fertilizers, reclamation of lands, training of farmers, etc.; therefore,

1. *Be it enacted by the Senate and General Assembly of the State of New Jersey*, That the board of managers and superintendent of the state geological survey; the president and two of the professors of the state agricultural college, chosen by the college faculty; three members of the board of visitors of the agricultural college, chosen by their board; the president or other representative sent by each of the state and county agricultural societies that may be in correspondence with this board, shall constitute the State Board of Agriculture.

2. *And be it enacted*, That the members of the board shall hold office for three years, or until their successors are appointed; except that of the first appointments the members shall be classed in three divisions, one-third of which shall retire from office in one year; one-third in two years; and the remaining third in three years; the vacancies thus occurring shall be filled in the same way the first appointments were made; other vacancies which may occur shall be filled in the same way, but only for the completion of the term in which they occur.

3. *And be it enacted*, That the board shall meet at the state house, in Trenton, at least once in each year, and as much oftener as may be judged expedient; no member thereof shall receive compensation from the state, except for personal expenses when engaged in the duties of the board.

4. *And be it enacted*, That the board may appoint their secretary and prescribe his duties; he shall receive a salary not to exceed two hundred dollars a year, and may, with the approval of the board, employ a clerk or clerks, at an expense of not more than one hundred dollars per year, which salary and expense shall be paid out of the treasury of the state.

5. *And be it enacted*, That the board may investigate such subjects relating to the improvements of lands and agriculture in this state as they may think proper, and may take, hold in trust, and exercise control over donations or bequests made to them for promoting scientific education, or the general interests of agriculture.

6. *And be it enacted*, That they shall prescribe forms for and regulate returns of the agricultural societies of the state in correspondence with them, and shall furnish said societies with proper blanks, so as to secure uniform and realiable statistics.

7. *And be it enacted*, That they shall annually, on or before the second Tuesday of January, by their chairman or secretary, submit to the legislature a detailed report of their doings, with such recommendations and suggestions as the interests in their charge may require.

8. *And be it enacted*, That the secretary of the board shall cause to be made and published for distribution as full an abstract of the returns of the agricultural societies as he judges to be useful.

Approved, April 4, 1872.

The Board held its first meeting at the College Farm, New Brunswick, September 4th, 1872, and effected a permanent organization by the election of His Excellency, Governor Joel Parker, President, and Professor George H. Cook, Secretary.

The second meeting of the Board was held at Trenton, March 5th, 1873, when the following By-Laws, reported by a committee previously appointed for that purpose, were adopted:

BY-LAWS FOR THE GOVERNMENT OF THE NEW-JERSEY STATE BOARD OF AGRICULTURE.

1. The officers of the Board shall be a President and Secretary, who shall be chosen each year, at the Regular Annual Meeting, in Trenton, and shall serve until their successors are elected.

2. Besides the Regular Annual Meeting of the Board, at Trenton, two meetings at least shall be held each year—one in the Spring, and one in the early Autumn. The President may at any time call special meetings of the Board; and he shall do so whenever requested in writing by any five active members.

3. The Standing Committee of the Board shall be as follows:

A Committee of three on the Culture of Staple Crops.

A Committee of three on Horticulture and Floriculture.

A Committee of three on Forest Culture.

A Committee of three on Diseases of Cattle.

A Committee of three on Legislation; and such other committees as the Board may from time to time appoint.

4. All Standing Committees shall be chosen by ballot at the Annual Meeting of the Board. Special Committees may be appointed at any time.

5. The duties of all committees, except the Executive Committee and Visiting Committe, shall be purely advisory.

6. The Board may from time to time elect Honorary Corresponding Members; *provided*, that all nominations for such membership shall be made in writing, by an active member of the Board, and passed upon by the Executive Committee previous to any election by the Board; and any election to be valid must be unanimous.

7. Honorary Corresponding Members may be appointed to serve on any Standing or Special Committee of the Board, and shall be entitled to all the privileges of active members, except the right to vote.

8. The order of business at the meetings of the Board shall be as follows:

1. Reading of Minutes of previous Meeting.
2. Reports of Standing Committees.
3. Reports of Special Committees.
4. Unfinished Business.
5. New Business, including the reception of communications from other bodies.

9. The Executive Committee of the Board shall consist of five members; one from the Board of Managers of the State Geological Survey; one from the Board of Visitors of the State Agricultural College; one from the Faculty of the State Agricultural College; one from the Societies in correspondence with the Board; and the Secretary of the Board, who shall be *ex-officio* a member of the Executive Committee, and its Secretary.

10. The Executive Committee shall be appointed by the Board each year at its regular Annual Meeting, in Trenton. It shall elect its own chairman, adopt its own rules of procedure, and meet as often as its business may require.

11. It shall be the duty of the Executive Committee to prepare business for all meetings of the Board; to arrange the time and place of public meetings of the Board, and to provide speakers, papers, &c., for the same; to consider what legislation may be necessary from time to time for the promotion of the agricultural interests of the State; to prepare and transmit to the Legislature the annual report required by law; to fill vacancies that may occur in the office of President or Secretary, or in any committee, subject to the confirmation of the Board at its next meeting; to maintain communication with similar bodies in other States, and with corresponding members or societies in the State of New Jersey; and to do whatever

else, subject to the revision of the Board, may be necessary and proper to carry out the purposes for which the Board is organized.

12. The Secretary of the Board, in addition to the duties usually belonging to that office, shall also act as Treasurer; and he may employ a Clerk, as authorized by law.

13. These By-Laws, or any of them, may be suspended at any meeting by vote of a majority of the active members present. They may be altered or amended, notice having been given at least one meeting previous.

At the same meeting a paper was read by the Secretary, setting forth the nature of the work undertaken by the Board. It was unanimously approved, and ordered to be entered in the minutes of the Board, as an authorized statement of its aims and duties. The following is a copy:

"The Board of Agriculture finds its duties in investigating and recording whatever concerns the Agricultural interests of New Jersey.

"Its investigations should include all facts relating to the various soils of the state; their chemical and mechanical condition; their productiveness and susceptibility of improvement; their means of access to the cheapest and best natural or artificial fertilizers; their adaptability to crops and fertilizers; the best methods of rearing, improving and fattening stock, including the prevention and eradication of all forms of disease among them; they should include also the examination of new implements, and processes of working the soil, and the best methods of drainage; the economy of farm management as applied to market gardening, farming or forestry; the proper laying out of a farm into pasture, meadow, tilled land and woods; the location, construction and economy of farm buildings and fences; the methods and principles of beautifying rural homes; and the consideration of what legislation may be needed to secure the interests of farmers.

"It is no part of its work to exhibit farm products, stock or implements; but on the contrary it seeks to maintain communication with all Societies, Associations and Clubs organized for such purposes within the State; to gather from them the results of their observations and experiments, and to furnish them in return results obtained from other Societies or digested material drawn from a comparison of the whole of the results together.

"It should make its investigations and results useful to the whole State by printing and distributing as widely as possible its reports and papers, and the results of experiments conducted under its advice in various parts of the State."

The next meeting of the Board was held, pursuant to adjournment, at the Agricultural College Farm, New Brunswick, on Tuesday, July 1st, at 11 o'clock in the forenoon.

Besides the members of the Board of Agriculture, some members of the Board of Visitors to the Agricultural College were present, and the whole party spent two or three hours in the inspection of the farm, observing the condition of the soils, the crops, the methods of tillage, and the various experiments in progress under the direction of Dr. George H. Cook. The crops were of course immature, and had been somewhat injured by the severe drouth of the last few weeks; but one that attracted particular attention was a field of Fultz wheat—a variety of bald white wheat which was remarked for its fine quality and early maturity. It stood very evenly in the ground, and was from four to eight days earlier than the ordinary Mediterranean wheat, grown on similar ground.

The crop of beets and carrots, of which there was a large area under cultivation, was very promising. They had been well manured with German potash salts. The whole farm is now in excellent condition. Every acre is in productive crops; and the change which has taken place since it came into possession of the Agricultural College, is a striking illustration of the benefits of scientific knowledge applied to ordinary farming. The members of the Board expressed themselves highly gratified with what they saw, and desirous that farmers from all parts of the State might make it in their way to visit the farm.

After the tour of inspection was completed, the party proceeded to the new Geological Hall, where a very interesting and profitable meeting of the Board was held. The most important subject presented was an account by Professor Cook of the various fertilizers that were being employed in experiments on the farm. He exhibited specimens of the fertilizers, with analyses of them, and a series of computations as to their real value compared with their selling price. The mode of making the computations was also shown.

As the results obtained are more fully developed in the report which follows, it is not thought necessary to repeat them here; but they were accepted by the Board as showing, in the first place, that fertilizers must be bought of thoroughly trustworthy and responsible parties, if one would have any assurance of their purity; and, in the second place, that our farmers, in order to get the full benefit of outside fertilizers, must be able to take advantage of the waste manures that happen to be within reach in their particular localities, be they malt-screenings, waste hair, fish refuse, or any other rich waste product. These materials exist in New Jersey in great variety and abundance, and adapted to the wants of her different soils, and a more intimate knowledge of the specific uses to which they can best be applied would be a very great and direct pecuniary advantage to the farming community.

The Board held its next meeting, on the invitation of the Directors of the State Agricultural Society, at their grounds in Waverly, on

the 17th day of September, 1873. The members of the Board received every attention from the officers of the Society, and, after an extended tour of the grounds and buildings, repaired to the President's tent, which that gentleman, Hon. Amos Clark, Jr., had kindly placed at their disposal, and there organized with the President, Governor Parker, in the chair. Such officers of the State Agricultural Society as were present were invited to sit with the Board.

After a brief interchange of views, in the course of which the members of the Board expressed themselves as highly gratified with what they had seen, the following resolutions, on motion of Henry K. How, Esq., were unanimously adopted:

Resolved, That the State Board of Agriculture, having accepted the invitation of the State Agricultral Society to inspect its exhibition of implements, live stock, fruits, grains, &c., have great pleasure in expressing their high appreciation of what they have witnessed, and in extending their congratulations to the officers and members of the Society, on the marked progress shown in this exposition.

Resolved, That they desire to extend a hearty encouragement to this and similar expositions, which they regard as highly beneficial to the agricultural and manufacturing interests of the State.

In response to these resolutions President Clark expressed his gratification at the visit of the Board, and his thanks for the complimentary manner in which they had spoken of the Society's exhibition.

The Board then adjourned.

REPORT.

INTRODUCTION.

New Jersey was first settled by farmers. Descendants of the Hollanders came from New York and Long Island, and settled in Hudson, Bergen, Morris, Passaic, Somerset, Hunterdon, Sussex, Warren, Monmouth, and Middlesex. Those of English parentage, from Connecticut and Eastern Long Island, settled in Essex, Morris, Union, Somerset, Hunterdon, Middlesex, Monmouth, Ocean, Burlington, Atlantic, Cape May and Cumberland. English settlers located in Salem, Gloucester, Camden, Burlington Mercer and Union; Scotchmen settled in parts of Middlesex and Monmouth; Swedes made settlements in Salem and Gloucester; Norwegians in Hudson and Bergen; Welch in Monmouth; Irish and Germans in Warren and Sussex. But all came to cultivate the soil.

Mines, manufactures and trade have drawn off large numbers of our people, and, at the present time, only one-fourth of our industrial population is engaged in agriculture.

The State, in size, is thirty-fourth in the list of thirty-seven States. It stands twentieth in the yearly value of its agricultural products, and twenty-sixth in the number of persons engaged in agricultural employments. In mining products it is the eleventh, in manufactures the seventh, in wealth the eighth, and in population the seventeenth in the Union. The value of its farm lands is greater, by the acre, than any other in the United States. And the mixed industry of its people, together with the nearness of the great markets of New York and Philadelphia, cause the products of the soil to bring larger returns than in any of its sister States. Its climate is mild, salubrious, and invigorating. There is still a wide field for increased production and profits, and the never-ceasing demands of our markets are a constant stimulus to greater efforts to supply them.

SOILS OF NEW JERSEY;

THEIR ORIGIN AND DISTRIBUTION.

The Board present, with their first Report, a map of the State, which shows the field of their operations. It is colored geologically,

so as to exhibit the location and arrangement of the different rocky and earthy formations in the State; and, since the soils have been mainly formed by the crumbling or decay of the rocks on which they lie, the map gives a general but distinct idea of the several characteristic classes of soil in the State. The table of colors, on the side of the map, is a key to the formations exhibited on the map itself; they stand in the order of their ages, the newest at the top, and the older further down, in order. The names opposite them are geological names, and the small figures in the tables correspond to similar figures on the map, so that if the same color is used for several formations, as in the limestones, the figure tells which one of them is meant. Some members of all the great geological formations are to be found in New Jersey, except that which contains the coal.

The production of earth and soil, directly from the rock, can be well seen in many places in the State. Along the line of the New Jersey Central Railroad, from Lebanon to Hampton, in Hunterdon County, remarkable examples of the change from rock to earth are to be seen. Between Lebanon and Clinton there is a long and deep cut through a hill of decayed gneiss or granite. It has once been solid rock, but is now so soft that it can be dug with a shovel, and one would scarcely believe that it had ever been any harder. Between Annandale and High Bridge the same kind of decayed rock is very abundant, and the steam excavator takes it out as readily as it would earth from a sand-bank. At Chester the whole soil is made up of this decayed material, so that, in digging down into the earth, we pass gradually from soft soil to crumbled rock, and then to that which is firmer, and then to that which is quite solid. About New Brunswick, the red shale is tolerably firm, and, over a large district, is covered only by a few inches of soil. But, wherever this shale is torn up and exposed to the sun and rain, it soon crumbles down into little pieces, and in a year or two becomes quite fine, and at last cannot be distinguished, in color or fineness, from the original soil, and is cultivated in our fields and gardens successfully. The soil over the limestones has not as much lime in it as there is in the rock, but presents more the appearance of the impurities of the limestone, as if the lime had been dissolved out, and all the other substances in it had been left to make the soil as it now is.

While this is the general explanation for the origin of our soils, there are many exceptions and modifications. The Northern Drift, which has swept over our whole surface, has carried much loose material from one formation to another, and has mixed up the different earths, so as to change their original character to a great extent. The washing of water, at some early period, has also sorted the materials in some places, leaving the gravel by itself, the sand in banks or beds by itself, and the clay, or finest part, in still another place. But while these changes have taken place, and in

this way the mechanical condition of the soil has been changed, the same characteristics will still remain, with all the varieties of soil, on the same geological formation. Thus the slate soils are everywhere recognized by their special adaptation te the growth of grass and pasture, and the pursuit of dairying. The limestone soils have been noted, from the first settlement of our country, for their abundant crops of wheat, rye, and corn, even under the most exhausting system of tillage. The gneiss soils, which are mostly on our hills and mountains, have come into cultivation more recently, but are proving to be of good quality, and well adapted to general farming. The soils on the red sandstones and shales, which, in a mixed husbandry, and under exhausting tillage, have grown poor, have given most generous returns under a more liberal system. The lighter soils of the marl region, and, indeed, of all the southern part of the state, on account of the ease with which they can be tilled, and their adaptation to fruit growing and market gardening, have been growing rapidly in the estimation of farmers. Even a slight knowledge of the characteristics of the farming in different parts of the State, and a study of the map, which shows the peculiarities in origin and quality of the soils, will make it apparent to any one that this is the proper way to study our capabilities for agriculture.

The old method of classifying soils as sandy, loamy or clayey, is only a statement of their mechanical condition. In the northern part of the State, they are so much stiffer and heavier than in the southern part, that what in the former would be called a sandy soil, would be called a clayey soil in the latter; and so great is the change made by drainage, and the removal of water, that ground which, before it was drained, was thought to be clayey, has proved after drainage to be a light loam in all sections of the State. These old terms will no doubt always be used to express the condition of land as to dryness and moisture, and perhaps as to fineness, but they give no indication of the quality of the soil or its fertility.

The analysis of soils was considered, or, rather hoped, to be a means of instructing the farmer as to the wants of his land, and the means of restoring its fertility at the least possible expense. These hopes have not been realized; and now the re-action is strongly against the analysis of soils, as of any practical value; and it is undoubtedly useless in the present state of our knowledge, to judge from the analysis of a single soil what its deficiencies are, or what fertilizer it needs to make it productive. So many circumstances affect it, besides its chemical composition, that a knowledge of that alone will be of little avail. The particles of soil must be fine and loose. There must be an open or in some way well drained subsoil. There must be at least a moderate supply of vegetable matter in the soil. There must be a sufficient amount, and not too much of moisture at all times. Wanting any of these conditions and there can be no good crop however rich the soil may be; and yet it will be

perceived that none of these can be taken as the basis for a system of agriculture. They are all necessary adjuncts, but do not occupy so important a place as the elements of the soil themselves do.

If this is correct, it must be that the composition of the soils will furnish a rational basis upon which to found a system of progressive and profitable farming. In the hands of mere theorizers such knowledge is of course useless, but in those of the intelligent and skillful farmer who understands the details of his business, it must be fruitful of good results; and with this belief, we present analyses of soils from several of the best known varieties in the State. They are not complete as a series, nor are they evenly distributed over the different sections of the State. The labor and expense of such a work is very great, and we could not go through with any more this year. Neither did it seem best to withhold these until we could complete the series. They will be suggestive and may help intelligent and inquiring farmers on the different soils, to study and experiment on them rationally.

Soils, their Chemical Composition.—The soils, we present analyses of are:

1. Soils from the gneiss region.
2. " " Magnesian limestone district.
3. " " Slate.
4. " " Red sandstone and shale.
5. " " Marl region.
6. " " Miocene districts.
7. " " Drift of southern New Jersey.
8. " " Alluvium of the sea border.
9. " " Tide marshes.

There are other well marked varieties of soils, from the trap-rocks, from the conglomerate rocks of the Green Pond mountains, from the valley of the Delaware, northwest of the Blue mountain, and perhaps others, but we have as yet no analyses of them.

GNEISS SOILS.

ANALYSES BY FUSION.

	1	2	3	4	5	6	7	8	9
Silica	71.35	76.65	60.20	69.40	66.05	64.20	73.55	82.13	76.50
Alumina	11.84	9.76	13.51	10.64	12.59	14.96	10.44	6.89	6.91
Oxide of iron	3.18	4.28	9.45	4.15	7.06	4.22	3.56	2.77	3.06
Lime	.81	.81	2.10	.64	1.48	1.15	.95	.37	.64
Magnesia	1.08	1.01	2.41	.99	1.12	1.39	1.95	1.27	.65
Potash	1.79	1.78	1.90	2.12	2.05	2.87	1.88	.86	1.07
Soda	.29	.25	.51	.37	.35	.76	.12	.67	.50
Sulphuric acid	.07	.02	.01	.07	.03	.05	.01	.04	.03
Chlorine	.02	trace.	trace.	.03	trace.	.01	trace.	trace.	.03
Phosphoric acid	.19	.22	.22	.16	.16	.18	.22	.06	.16
Organic matter	6.55	2.71	6.45	7.88	5 86	7.40	5.35	3.26	8.55
Water	1.65	1.29	1.65	1.92	1.99	1.30	1.45	1.18	1.55
Total	98.82	98.78	98.41	98.37	98.74	98.49	99.48	99.50	99.65

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	81.20	85.60	76.60	80.20	79.55	79.80	82.45	84.08	79.60
Alumina	5.97	5.68	5.65	5.15	6.02	5.43	5.24	4.04	4.54
Oxide of iron	2.78	3.06	7.65	3.88	5.88	4.22	3.51	*4.56	3.09
Lime	.45	.22	.67	.28	.64	.36	.48	* .50	.30
Magnesia	.90	.65	.61	.50	.67	.88	.83	.97	.54
Potash	.19	.11	.17	.13	.04	.16	.18	.22	.10
Soda	.09	.04	.03	.03	.07	.04	.04	.15	.07
Sulphuric acid	.07	.02	.01	.07	.03	.05	.01	.04	.03
Chlorine	.02	trace.	trace.	.03	trace.	.01	trace	.01	.03
Phosphoric acid	.19	.22	.22	.16	.16	.18	.22	.09	.16
Organic matter	6.55	2.71	6.45	7.88	5.86	6.95	5.35	3.73	8.55
Water	1.65	1.29	1.65	1.92	1.99	1.30	1.45	1.35	1.55
Total	100.06	99.60	99 71	100.23	100.91	99.38	99.76	99.74	98.37

No. 1 is an analysis of a soil from lands of John Hixon, near Bridgeville, Warren county.

No. 2 is a subsoil from the same place. The locality is so near the blue limestone outcrop that these soils are not so fairly representative of the gneiss as the others given in this table. They are very fine and resemble the limestone soils in color.

Nos. 3 *and* 4 are soils from the farm of Philip Raub, Oxford, Warren county. Both are fine and free from stone.

No. 5 is from a field of E. Beers, Oxford, Warren county. This was taken from a clover field which has been limed.

No. 6 is also from Beers' farm, but from new ground, never limed. Both this and *No.* 5 are very fine.

No. 7.—Soil from Aaron Smith's farm, one mile north of Oxford Furnace, Warren county.

No. 8.—A subsoil from Hampton Junction, Hunterdon county. This is almost all disintegrated gneiss rock.

* In this soil the coarser rock fragments were picked out and the analysis by fusion was of the finer portion left. In that by acid, the sample as collected was used. The excess of oxide of iron and lime in the latter analysis over that by fusion is due to the removal of a little earth adhering to the rock picked out.

No. 9.—From fields of M. J. Ryerson, south of Bloomingdale, in Morris county. It is very fine. Boulders occur in the soil at this locality.

These soils cover the mountain region in the counties of Passaic, Bergen, Sussex, Warren, Morris, Somerset and Hunterdon, comprising an area of seven hundred and seventy square miles. The soil is sufficiently abundant on all parts of this area, but in the middle and northeastern portion of this highland region much of it is so mixed with loose stones and boulders as to be worthless for cultivation. It is, however, covered by a vigorous growth of oak and chestnut timber. A large part of the middle and southwest portion of this belt have been cleared and are now in cultivation, yielding good crops of corn, rye, oats, wheat and grass. In most places it has been enriched by the use of lime and clover only. It has in it the elements of a fertile soil, and wherever it is sufficiently dry it is susceptible of the highest improvement. The heavier soils of this class are well adapted to grass and pasturage.

MAGNESIAN LIMESTONE SOILS.

ANALYSES BY FUSION.

	1	2	3	4	5	6	7	8
Silica	70.30	68.70	69.03	68.05	64.20	58.77	65.85	62.20
Alumina	10.73	13.37	12.21	13.24	14.27	19.08	13.90	18 31
Oxide of iron	3.52	5.14	3.99	6.60	4.38	6.88	2.76	5.54
Lime	.84	.17	.53	.39	1.23	.39	.62	.42
Magnesia	.97	1.26	1.01	.91	3 56	1.20	1.69	.90
Potash	4.34	4.27	3.75	3.90	5.46	4.47	4.29	5.15
Soda	.37	.18	.24	.23	.84	.30	.88	.55
Sulphuric acid	.02	.05	none	.06	.07	trace	none	.02
Chlorine	trace	.01	trace	trace	.02	.02	.02	trace
Phosphoric acid	.26	.16	.07	.07	.32	.05	.15	.15
Organic matter	6.26	3.12	6.00	3.50	4.35	4.90	7.80	3.85
Water	1.54	2.58	1.55	2.15	.90	1.60	1.55	1.60
Total	99.15	99.01	98 38	99.10	99.60	97.66	99.51	98.69

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	82.25	86.60	81.93	81.90				
Alumina	5.03	2.46	5.76	5.41				
Oxide of iron	3.46	4 74	3.45	6.39				
Lime	.45	.17	.28	.25				
Magnesia	.49	.61	.65	.72				
Potash	.30	.36	.12	.21				
Soda	.07	07	.02	.04				
Sulphuric acid	.02	.05		.06				
Chlorine	trace	.01	trace	trace				
Phosphoric acid	.26	.16	.07	.07				
Organic matter	6.26	3.12	6.00	3.50				
Water	1.54	2.58	1.55	2.15				
Total	100.13	100.93	99.83	100.70				

No. 1 is a soil and *No.* 2 a subsoil from William Shields' farm, near the New Hampton and Washington road, in the Musconetcong Valley.

No. 3 is a soil and *No.* 4 a subsoil taken from a field near Asbury, also in the Musconetcong Valley.

No. 5 is a soil from Riegelsville, Warren county.

No. 6 is a soil from Bethlehem, Pa.

No. 7 is a soil from a field one and a half miles south of Lebanon, Pa., and near the road to Cornwall.

No. 8.—This came from a field one mile south of Lebanon, Pa. It is a subsoil.

Nos. 6, 7 *and* 8 (from Pennsylvania) were examined to show the uniformity in composition of the soils on the Magnesian Limestone.

These limestone soils are all finer and more ochrey yellow in color than the gneiss rock soils.

They are found in the valleys of the streams in the northwest part of the State, chiefly in Warren and Sussex counties. They are level, or rolling, easily cleared and tilled, and are very productive. Wheat, rye, oats, buckwheat and corn have been the staple products, and a large surplus has been produced every year. There is no other part of the United States which supports so large a population, in purely agricultural pursuits, as some of these magnesian limestone soils in Warren county. Plaster was very generally used at the first introduction of clover, and was thought to help its growth. It is still used, but not so much as formerly. Lime is the chief fertilizer, after barnyard manure, and fields are known which have been cultivated in corn, wheat and clover for seventy years, with no manure except lime, and which still yield good crops.

SLATE SOILS.

ANALYSES BY FUSION.

	1.	2.
Silica	62.90	68.60
Alumina	16.18	12.56
Oxide of iron	5.63	6.57
Lime	.48	.64
Magnesia	2.10	1.22
Potash	4.06	3.67
Soda	trace.	.20
Sulphuric acid	.07	.02
Chlorine	trace.	trace.
Phosphoric acid	.32	.02
Organic matter	6.55	3 69
Water	1.55	1.81
Total	99.84	99.00

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acids	77.75	82.70
Alumina	6.27	4.98
Oxide of iron	5.63	6.52
Lime	.34	.06
Magnesia	1.51	.29
Potash	.12	.09
Soda	trace.	.01
Sulphuric acid	.07	.02
Chlorine	trace.	trace.
Phosphoric acid	.32	.02
Organic Matter	6.55	3.69
Water	1.55	1.81
Total	100.11	100.19

No. 1 is a soil and *No.* 2 a subsoil, both from the Kittatinny Valley, two miles southwest of Asbury, Warren county.

These are the soils on which the rich pastures of Sussex county, and of Orange county, New York, grow. They are specially adapted to the production of grass of the best quality, and the butter made in the districts where these soils are found has long been famed for its excellence. The soil is heavy and not so easily tilled as that which is more sandy, but it is rich and produces fine crops of corn and grain. The specimens analyzed were taken from over slate rock, but they may be a little mixed with soil from the magnesian limestone which was less than a mile from them.

RED SANDSTONE AND SHALE SOILS.

ANALYSES BY FUSION.

	1	2	3	4	5	6	7	8
Silica	68.10	63.50						
Alumina	13.53	13.05						
Oxide of iron	4.97	5.04						
Lime	.50	1.18						
Magnesia	1 12	1.31						
Potash	1.91	1.57						
Soda	.34	1.90						
Sulphuric acid	.03	.15						
Chlorine	.05	.01						
Phosphoric acid	.13	.17						
Organic matter	5.70	9.20						
Water	2.80	2.60						
Total	99.18	99.68						

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid...	80.40	77.97	79.16	79.70	71.07	73.50	87.14	86.10
Alumina.....	5.42	4.76	6.88	4.49	9.26	6.70	4.16	3.53
Oxide of iron.....	4 30	4.03	3.59	8.59	6.56	6.20	3.30	3.15
Lime.....	.26	.50	.30	.21	.22	.13	.12	.24
Magnesia.....	.79	.97	.61	1.91	2.02	1.33	.72	.90
Potash	.20	.23	.27	.59	.81	.46	.00	trace.
Soda	.15	.10	trace.	.11	.20	.39	.00	.00
Sulphuric acid.....	.03	.08	.08	.03	.03	.06	trace.	.12
Chlorine.....	.05	.01	.01	trace.	.01	.02	trace.	trace.
Phosphoric acid...	.13	.17	.13	.15	.14	.20	.02	.02
Organic matter.....	5.70	9.26	7.60	1.75	5.00	7.97	3.00	4.85
Water	2.80	2.60	1.80	2.00	3.80	2.70	.90	1.10
Total.....	100.23	100 62	100.43	99.58	99.12	99 66	99.36	100.01

No. 1 is from the Agricultural College Farm, near the city reservoir, New Brunswick. It is evidently red shale, with some drift clay and gravel.

No. 2 is an alluvial soil, on red shale, taken from a field north of the road, and east of the Raritan River, at Raritan Landing, Middlesex County.

No. 3 is from the same locality as No. 2. but from the south side of the road.

No. 4 is red shale, near the college, New Brunswick.

No. 5 is a very red shale soil, from a field in the outskirts of New Brunswick.

No. 6 is from the side of the street, corner of Sicard and Morrill streets, New Brunswick.

Nos. 7 and 8 are Drift soils on the red shale, from the farm of J. Cook, Hanover, Morris county.

These are the soils so well known to all who have traveled by rail between New York and Philadelphia, from their strong purplish red color. They have all been cleared, where not too wet or rough, and have been cultivated in general farming, being equally adapted to grass, cultivated crops and market gardening. They have been worn out by exhausting tillage, but are easily restored to their original fertility. From the earliest settlement of our State they have been noted for the excellence of the fruits grown on them. The apples and peaches, in particular, were thought to be richer and of better flavor than those grown on other soils. Newark cider was made from apples grown on these soils, and it is still unequalled in its richness and its lack of the sourness which makes *hard cider.* The same peculiarity is claimed for the peach. Neither of them were larger or fairer than those from other soils, and of late years the injuries from various insects have destroyed or damaged so many of them that their culture has been discouraged and neglected,

though the fruit is still as rich as ever. The analyses are not sufficiently numerous to properly exhibit the composition and peculiarities of these soils.

SOILS FROM THE MARL REGION.

ANALYSIS BY FUSION.

	1	2	3	4
Silica	79.30			
Alumina	1.81			
Oxide of iron	1.71			
Lime	.82			
Magnesia	.23			
Potash	.77			
Soda	.03			
Sulphuric acid	.12			
Chlorine	.14			
Phosphoric acid	.11			
Organic matter	12.56			
Water	2.24			
Total	99.84			

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	82 62	94.70	89.99	88.60
Alumina	1.09	1.49	1.19	2.20
Oxide of iron	1.66	1.25	1.82	2.57
Lime	.08	.08	.16	.26
Magnesia	.40	.32	.40	.76
Potash	.14	.12	.12	.14
Soda				
Sulphuric acid	.12	.04	.10	.08
Chlorine	.14	.02	trace	.01
Phosphoric acid	.11	.10	.18	.13
Organic matter	12.56	.70	3.90	3.70
Water	2.24	1.20	1.40	1.30
Total	101.16	100.02	99.21	*99.75

No. 1 is a soil from the farm of D. C. Andrews, Woodbury, Gloucester county.

No. 2.—Subsoil from the farm of Benjamin Cooper, Cooper's Point, Camden.

No. 3.—Soil from the same place.

No. 4.—An exhausted soil from the same place. The lime in it is in the form of carbonate, in lumps, evidently added recently, and not yet intimately mixed with it.

* To this should be added 51 of carbonic acid, making a total of 100.29.

These are the soils which were cultivated by the first settlers of West Jersey and also by those of Monmouth county. They are light and easily exhausted, except on the outcrops of the marl beds; but the generous use of the marl has renovated them, and they are now the most thoroughly cultivated of any lands in the State, and they probably yield the largest returns. They are generally better adapted to cultivated crops than to grass and pasturage. Potatoes, corn, wheat, clover and timothy are the staple crops, though large quantities of fruits and garden vegetables are grown on them, and some of the examples of apple culture can hardly be excelled. The number of soils analyzed is not enough to fully bring out the peculiarities in their composition.

MIOCENE SOILS.

ANALYSES BY FUSION.

	1.	2.	3.	4.	5.	6.	7.
Silica	88.80	84 80	78.85	.....	85.15	.....	79.60
Alumina	3.86	6.53	9.38	.....	5.91	.....	5.07
Oxide of iron	3.48	1.92	3.68	.....	1.85	.....	6.80
Lime	.14	.48	.23	.....	.14	.....	.13
Magnesia	.36	.40	.72	.....	.48	.....	.57
Potash	.10	.81	1.26	.....	.77	.....	1.20
Soda	.....	.44	.42	.....	.26	.....	.12
Sulphuric acid	.05	.08	.05	.....	.04	.....	.39
Chlorine	.05	.01	.02	.....	.02	.....	.06
Phosphoric acid	.06	.05	.07	.....	.04	.....	.18
Organic matter	1.60	1.90	3.00	.....	3.40	.....	3.70
Water	1.70	1.60	1.10	.....	.70	.....	1.20
Total	100.20	99.02	98.78	.....	98.76	.....	99.02

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	92.28	87.25	83.10	90.70	87.54	85.55
Alumina	2.27	5.26	5.45	3.60	3.33	3.37
Oxide of iron	1.64	3.07	2.25	1.05	1.61	5.60
Lime	.20	.12	trace.	.13	trace.	.13
Magnesia	.25	.61	.74	.32	.36	.39
Potash	.09	.13	.19	.24	.16	.19
Soda	trace.	trace.	trace.	trace.	.03	trace.
Sulphuric acid	.08	.05	trace.	.04	.03	.12
Chlorine	.01	.02	trace.	.02	trace.	.06
Phosphoric acid	.05	.07	.05	.04	.05	.18
Organic matter	1.90	3.00	6.60	3.40	5.39	3.70
Water	1.60	1.10	2.00	.70	1.60	1.20
Total	100.37	100.68	100.38	100.24	100.10	100.49

MECHANICAL ANALYSES.

	1	2	3	4	5	6	7
Earth	81.32	81.92	92.66	85.52	59.22	79.32	96.50
Grains, 1-200 to 1-150 inch in diameter	2.52	2.84	1.28	1.64	2.50	4.58	1.26
Grains, 1-150 to 1-100 inch in diameter	8.24	8.16	2.96	6.34	7.20	8.14	1.34
Grains, 1-100 to 1-30 inch in diameter	3.50	4.82	2.42	5.60	18.94	6.04	.68
Grains, 1-30 to 1-15 inch in diameter	1.38	1.06	.68	.74	8.02	1.46	.22
Grains, exceeding 1-15 inch in diameter, and pebbles,	3.04	1.20	.00	.16	4.12	.46	.....
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

No. 1. A subsoil from the farm of J. Glaspey, Greenwich, Cumberland county.

No. 2. Soil from the same place.

No. 3. Subsoil from Michael Minch's farm, Shiloh, Cumberland county.

No. 4. Soil from the same place. It had never been cultivated.

No. 5. A worn out soil from the same place.

No. 6. Soil from the farm of the late Providence Ludlam, near Roadstown, Cumberland county.

No. 7. A red marl from Hummel's pits near Shiloh, Cumberland county. This is a very fine purplish-red subsoil or earth, which is used as a fertilizer on a few farms near the pits where it is dug.

All of these are very fine and contain considerably less quartz sand than the soils in the marl region or those of the drift of the southern parts of the State.

This division includes the heavier and more retentive soils about the district in which the calcareous marls of Cumberland county occur. Deerfield, and parts of the adjoining townships in Cumberland, Upper Alloways Creek, Pittsgrove and Upper Pittsgrove, in Salem counties, are mostly in the region of these soils. They have long been cultivated in staple farm crops and are considered to be among the best in South Jersey.

DRIFT SOILS OF SOUTHERN NEW JERSEY.

ANALYSES BY FUSION.

	1	2	3	4	5	6	7	8
Silica	94.60	96.20	96.87	90.53	81.69	93.92	95.63	.....
Alumina	1.83	2.41	.81	4.27	10.82	2.47	1.47	.....
Oxide of iron	.17	.39	.38	1.30	1.52	.77	.58	.....
Lime	.28	trace.	.07	.11	trace.	trace.	.02	.....
Magnesia	.18	.14	.07	.19	.15	.06	.09	.....
Potash	.21	.06	.03	.36	.20	.14	.02	.....
Soda	.10	.32	.10	.14	trace.	.04	.15	.....
Sulphuric acid	trace.	.06	none.	.05	.06	.08	.05	.....
Chlorine	.01	trace.	.05	trace.	.02	trace.	trace.	.....
Phosphoric acid	.02	trace.	.01	.03	trace.	.02	trace.	.....
Organic matter	2.35	.20	.51	2.55	4.25	1.74	2.29	.....
Water	.35	.80	.55	.65	.55	.70	.35	.....
Total	100.10	100.58	99.45	100.18	99.26	99.94	100.65	.....

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	96.95	97.24	96.72	91.68	89.40	93.78	94.60	94.50
Alumina	.18	.66	.84	2.84	3.95	2.04	1.05	2.76
Oxide of iron	.17	.26	* .60	* 1.61	1.43	1.14	* .73	.75
Lime	.01	.03	.07	.06	trace.	.04	.06	trace.
Magnesia	trace.	.20	.18	.11	.11	.04	.04	.07
Potash	.02	.03	.05	.06	.07	.14	.08	.06
Soda	.10	trace.	.09	trace.	.07	.13	trace.	.03
Sulphuric acid	.12	.06	none.	.05	.05	.08	.05	.02
Chlorine	trace.	trace	trace.	trace.	.02	trace.	trace.	trace.
Phosphoric acid	trace.	trace.	.02	.05	.03	.02	trace.	trace.
Organic matter	2.55	.20	.51	2.55	4.25	1.74	2.29	1.10
Water	.35	.80	.55	.61	.55	.70	.35	.60
Total	100.45	99.48	99.63	99.62	99.93	99.85	99.25	99.89

MECHANICAL ANALYSES.

Earth	23.77	24.71	37.89	42.84	35.09	40.94	31.12	15.96
Grains, 1-200 to 1-150 inch in diameter	8.80	7.16	12.84	2.33	1.26	10.24	4 90	2.40
Grains, 1-150 to 1-100 inch in diameter	29.05	31.48	24.67	10.38	5.34	25.37	22.73	22.26
Grains, 1-100 to 1-30 inch in diameter	33.74	31.15	20.91	25.72	34.16	16.78	34.04	40.36
Grains, 1–30 to 1–15 inch in diameter	4.29	4.92	3.43	8.23	18.83	3.52	5.83	13.56
Grains, exceeding 1-15 inch in diameter, and pebbles	.35	.58	.26	10.50	5.32	3.15	1.38	5.46
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* In these samples the gravel and coarse sand were removed by washing and the residue was analyzed by fluxing. The analyses by acids were of the soils as collected. A very slight amount of adhering earth removed with the sand explains the smaller percentages of oxide of iron and lime in the analyses by fusion.

No. 1.—A soil one mile east of the New Jersey Southern Railroad, near Butler's place and Cedar Bridge road, in Woodland township, Burlington county. This is almost wholly a course, white sand with a little organic matter in the form of charred bark, bits of pine twigs and leaves and small roots. In the above analysis it will be noted that the sand and organic matter make up ninety-seven per cent. of the whole.

No. 2.—Soil from near the upper tavern, Cedar Bridge, Ocean county.

No. 3.—Soil from Ong's Hat, Burlington county.

No. 4.—Soil from lands of E. R. Spaulding, Forked River, Ocean county.

No. 5.—A subsoil, one foot below the surface, West Plains, Burlington county, near the road from Pemberton to Cedar Bridge. It consists almost exclusively of quartz and white clay, as may be seen by reference to the analysis. In the amount of alumina it differs from all the other soils whose analyses are included in this table. As is well known, this soil supports but a very scanty growth of stunted pines and oaks.

No. 6.—A soil from Hammonton, Atlantic county.

No. 7.—Soil from Winslow, Camden county.

No. 8.—A gravelly subsoil from Absecon, Atlantic county.

All of these drift soils, excepting that from Butler's place, are light yellow in color, and all contain more quartz sand than the soils of the other districts of the State.

These are the soils of the greater portion of the State, south and southeast of the marl region. They have been chiefly covered by a growth of yellow pine and some oak. The soil has been considered poor, and has been held in very large tracts, uncleared. The analyses show a larger percentage of quartz and less of the other mineral constituents found in our soils. With good tillage and judicious manuring these soils produce good crops. A well-known farmer has had a crop of forty-three bushels of wheat per acre on a field of thirteen acres; seventy to seventy-five bushels of shelled corn per acre; and crops of oats, potatoes and hay correspondingly large, on one of these drift soils. Now that land in general has risen in value, they are coming into competition with the heavier and more retentive soils of the middle and northern parts of the State. They require more manure to raise crops, but they are less affected by drought and are tilled at less cost. Several thousand settlers have located upon them within a few years past, and are now cultivating them successfully in fruit and in farm and garden products.

ALLUVIAL SOILS OF THE SEA-BORDER.

ANALYSES BY FUSION.

	1	2	3	4	5	6	7
Silica	89.05	89.40	.....	.....	87.9	.....	75.30
Alumina	3.13	3.86	.....	.....	4.11	.....	10.07
Oxide of iron	.77	1.23	.....	.....	1.66	.....	1.78
Lime	.86	.35	.....	.....	.39	.....	.60
Magnesia	.18	.23	.....	.....	.40	.....	.66
Potash	.46	.95	.....	.....	.55	.....	1.26
Soda	.20	trace.	.....	.....	.33	.....	.53
Sulphuric acid	.03	trace.	.....	.....	.07	.....	.04
Chlorine	trace.	trace	.....	.....	.02	.....	.00
Phosphoric acid	.05	.06	.....	.....	.04	.....	.09
Organic matter	3.25	2.30	.....	.....	3.40	.....	7.59
Water	.85	.90	.....	.....	1.30	.....	1.45
Total	98.83	99.28	.....	.....	100.17	.....	99.37

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	.....	.....	90.95	90.00	.....	86.50	.....
Alumina	.....	.....	2.47	4 20	.....	1.56	.....
Oxide of iron	.....	.....	.82	2.22	.....	2.13	.....
Lime	.....	.....	.53	trace.	.....	.31	.....
Magnesia	.....	.....	.29	.32	.....	.47	.....
Potash	.....	.....	.18	.12	.....	.16	.....
Soda	.....	.....	trace.	trace.	.....	.14	.....
Sulphuric acid	.....	.....	.08	.01	.....	.02	.....
Chlorine	.....	.....	trace.	.01	.....	trace.	.....
Phosphoric acid	.....	.....	.06	.03	.....	trace.	.....
Organic matter	.....	.....	3.40	1.90	.....	6.65	.....
Water	.....	.....	.80	1.20	.....	1.60	.....
Total	.....	.....	99.58	100.01	.....	99.54	.....

MECHANICAL ANALYSES.

Earth	36.66	36.06	64.92	43.30	42.40	90.46	80.81
Grains 1-200 to 1-150 inch in diameter	4.85	10.96	11.36	11.46	4.96	1.82	3.45
Grains 1-150 to 1-100 inch in diameter	25.22	21.98	10.02	17.76	26.16	4.70	9.38
Grains 1-100 to 1-30 inch in diameter	25.85	22.34	11.14	14.92	23.46	2.50	5.37
Grains 1-30 to 1-15 inch in diameter	3.99	7.30	1.00	4.54	2.04	.52	.86
Grains exceeding 1-15 inch in diameter and pebbles	3.43	1.36	1.56	8.02	.98	0.00	.13
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

No. 1.—A soil from the lands of Dr. Theodore T. Price, Tuckerton, Burlington county.

No. 2.—Soil from a field of Joshua Swain, Townsend's Inlet, Cape May county.

No. 3.—Soil from the farm of Downes Edmunds, near the Cape May Light House. This soil "has been worked for a hundred years, with a three or four years' rotation of field-crops only, and still produces fifty bushels, or upwards, of corn per acre." The analysis shows a large percentage, relatively, of lime, magnesia, potash, sulphuric and phosphoric acids, as compared with the other numbers of this table.

No. 4.—A subsoil from the farm of William J. Bates, of Fishing Creek, Cape May.

No. 5.—Soil from J. L. Smith's farm, Stipson's Island, Cape May.

No. 6.—Soil from farm of John T. Bacon, Greenwich township, Cumberland county.

No. 7.—A soil from the farm of David Lloyd, Lower Penns Neck, Salem county.

These alluvial soils of the sea border, in the southern part of the State, are all very fine-granular, and the quartz sand in them is neither so great in amount, nor so coarse as that in the drift soils of Southern New Jersey. As is indicated by the analyses, they contain, comparatively, a large percentage of lime, potash, phosphoric and sulphuric acids.

They are all but a few feet above the level of the sea, and constitute a well-marked feature of the State along the sea border, from below Long Branch to Cape May, and along Delaware Bay and river quite to Camden. The larger part of Cape May county is occupied by them. They contain a considerable amount of vegetable matter, and also the fertilizing mineral elements. They may be classed as sandy loam. The district in which they are found has been cleared for many years, and is very rich and productive, adapted to all kinds of farm and garden crops, and specially to the raising of fruits, easily tilled, and not difficult to keep in good condition.

SOILS OF THE TIDE MARSHES.

ANALYSES BY FUSION.

	1	2	3
Silica	63.50	51.85	64.07
Alumina	13.53	14.33	9.40
Oxide of iron	5.05	6.83	2.92
Lime	.34	.86	2.17
Magnesia	.90	1.91	1.66
Potash	1.48	1.57	2.38
Soda	1.14	.74	1.07
Sulphuric acid	.30	2.47	1.70
Chlorine	.12	.85	1.21
Phosphoric acid	.64	.34	.33
Organic matter	13.11	8 62	6.27
Water		8.01	5.36
Carbonic acid	0.00	.55	.84
Total	100.11	98.93	99.38

No. 1 is known as a gray mud, and is from the meadow of Thomas Shourds, Hancock's Bridge, Salem county.

No. 2 was taken from the surface of the marsh opposite South Dennisville, Cape May county, and is entirely composed of the deposit of one winter.

No. 3 was taken from the bank of a creek, in Richard C. Holmes' meadow, near Cape May Court House.

These soils are very fine, being muddy deposits of tide-water.

The area of tide-marsh in New Jersey is not far from three hundred thousand acres. That in Salem county has been partly reclaimed for one hundred and fifty years past, and portions of that in Cumberland, Cape May, and also in Essex and Hudson counties have been more recently embanked, and are being brought into cultivation. These soils are remarkably rich and productive. They only need to be kept dry and well tilled, and they will continue to grow good crops for an indefinite length of time, without manure.

For purposes of comparison, the following analyses of Western soils, noted for their richness and enduring fertility, are here given. Two of them are from the *bottom lands* in the valley of the Miami River, Ohio, and were brought to the State Laboratory by Professor Jacob Cooper, of Rutgers College. The remaining two are examples of the best prairie soils of the West, and are from near Jerseyville, Illinois, sent by P. R. Parsells, a resident farmer near that town.

SOILS IN OHIO AND ILLINOIS.

ANALYSES BY FUSION.

	1.	2.	3.	4.
Silica	.....	.....	74.21	77.80
Alumina	.....	.....	7.95	10.17
Oxide of iron	.....	.....	1.76	1.96
Lime	.....	.....	1.01	.50
Magnesia	.....	.....	.68	.67
Potash	.....	.....	1.34	1.73
Soda	.....	.....	.22	.33
Sulphuric acid	.....	.....	.14	.03
Chlorine	.....	.....	trace	.01
Phosphoric acid	.....	.....	.10	.08
Organic matter	.....	.....	8.70	4.55
Water	.....	.....	2.70	1.55
Carbonic acid	.....	.....	.79	.....
Total	.....	.....	99.50	99.43

ANALYSES BY HYDROCHLORIC ACID.

Insoluble in acid	57.60	65.20	82.60	88.60
Alumina	2.18	3.89	2.44	2.58
Oxide of iron	2.23	3.78	1.93	2.13
Lime	9 43	4.65	.70	.22
Magnesia	4.44	3.90	.47	.61
Potash	.24	.43	.12	.19
Soda	.....	.....	.12	.....
Sulphuric acid	.11	.11	.14	.08
Chlorine	.03	.02	trace.	.02
Phosphoric acid	.29	.29	.10	.08
Organic matter	9.70	7.23	8.70	4.55
Water	3.05	4.10	2.70	1.55
Carbonic acid	10.35	5.85	.79	.....
Total	99.65	99.45	100.81	100.61

No. 1.—Virgin soil from the Great Miami River bottom, Ohio.

No. 2.—Soil from the above-mentioned river bottom, which has been cultivated for eighty years past without manure.

They rest upon a calcareous marl as a subsoil and themselves contain much carbonate of lime.

Nos. 3 *and* 4 are prairie soils from the farm of Peter R. Parsells, three miles east of Jerseyville, Jersey county, Illinois.

No. 3 is black and contains no roots.

No. 4 is reddish-grey and has some fine rootlets mixed through the mass.

As compared with our best New Jersey soils these do not differ very materially from them, excepting in the large percentage of carbonate of lime.

For an easy and fair comparison of the several varieties of soils analyzed and arranged in the preceding sub-divisions, the averages of them as thus grouped are put together in the following table. This includes all the soils of the gneiss, the magnesian limestone, the slate, the red shale and sandstone, excepting numbers seven and eight, those of the marl region which were analyzed by acid, the miocene soils, those of the drift of Southern New Jersey and the alluvium of the sea border. With them are placed the averages of two sets of alluvial soils, one from Ohio and the other from Illinois.

In consequence of the incompleteness of these tables of analyses, some of them being by fusion, while others in the same division are by acid, the averages show some apparent discrepancies, particularly in the percentages of oxide of iron, and lime. Had the series been completed, no such differences would appear, as is evident from an inspection of the averages of the gneiss soils which were all analyzed both ways. In the gneiss also the average more properly represents their composition, as the number of analyses was large. Where there are but two or three analyses, the average is of less value as a representative of a class of soils.

TABLE OF AVERAGES.

ANALYSES BY FUSION.

	Gneiss.	Magnesian limestone.	Slate.	Red shale and sandstone.	Marl.	Miocene.	Drift of South Jersey.	Alluvium of the sea border.	Illinois prairie.	Miami Valley, Ohio.
Silica	71.11	65.89	65.75	65,80	.....	83.44	92.78	85.41	76.00	.....
Alumina	10 84	14.39	14.37	13.29	.....	6.15	3.44	5,29	9.06	.....
Oxide of iron	4.64	4.85	6.10	5.00	.....	3.54	.73	1.36	1.86	.....
Lime	.99	.57	.56	.84	.....	.22	.07	.55	.76	.....
Magnesia	1.32	1.41	1.66	1.21	.....	.51	.12	.37	.68	.....
Potash	1.81	4.45	3.86	1.74	.....	.83	.14	.80	1.53	.....
Soda	.42	.45	.20	1.12	.....	.25	.12	.26	.28	.....
Sulphuric acid	.04	.03	.04	.09	.....	.12	.04	.03	.11	.....
Chlorine	.01	.01	trace	.03	.....	.03	.01	trace	.....	.....
Phosphoric acid	.17	.15	.17	.15	.....	.08	.01	.06	.09	.....
Organic matter	6.00	4.97	5.12	7.45	.....	2.72	1.98	4.13	6.62	.....
Water	1.55	1.68	1.68	2 70	.....	1.26	.56	1.12	2.12	.....
Carbonic acid	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	98.90	98 88	99.51	99.42	.....	99.15	100.00	99.38	99.11	.....

ANALYSES BY ACID.

Insoluble in acid	81.01	83.17	80.22	76.97	88 98	87.74	94.36	89.15	85 60	61.40
Alumina	5.30	4.66	5.62	6.25	1.49	3.88	1.79	2.74	2.51	3 04
Oxide of iron	4.29	4.51	6 05	5.54	1.22	2.54	.84	1.72	2.03	3.01
Lime	.43	.29	.20	.27	.14	.09	.03	.28	.46	7.04
Magnesia	.73	.62	.90	1.27	.47	.44	.09	.36	.54	4.17
Potash	.14	.25	.10	.42	.13	.17	.06	.15	.16	.34
Soda	.06	.05	trace	.16	.....	trace	.05	.05	.06	.....
Sulphuric acid	.04	.03	.04	.06	.08	.05	.05	.03	.11	.11
Chlorine	.01	trace	trace	.02	.04	.02	trace	trace	.01	.03
Phosphoric acid	.18	.14	.17	.15	.12	.07	.01	.03	.09	.29
Organic matter	6 00	4.72	5.12	6 20	5.21	4.00	1 89	3.98	6.62	8.47
Water	1.57	1.95	1.66	2.60	1.53	1.33	.56	1.20	2.18	3.57
Carbonic acid	.....	.....	.....	.....	.....	.....	.....	.....	.....	8.10
Total	99.81	100 39	100.13	99.91	99 41	100.33	99.73	99.69	100.37	99.57

Many of these soil analyses have been made in two ways, one by fusing them with potash and soda, and so determining the whole amount of substance in them, whether it is completely locked up so as to be unacted upon by the weather and fertilizers or is easily dissolved by water or weak acids; the other method is by digesting the soil in hydrochloric or muriatic acid, and only determining the parts which dissolve out. It has generally been considered that the method by acids is the most like the action of rain and other agents in the soil. We have, as far as possible, given the results of both methods. The phosphoric acid however has only been determined in the analyses by hydrochloric acid, and the same determination has been inserted in the results by fusion.

SOIL—ITS WEIGHT COMPARED WITH THAT TAKEN OUT BY CROPS.

A cubic foot of soil has a weight of from seventy to one hundred and ten pounds, varying according to its composition. If we take eighty pounds as an average, and consider the soil to be six inches deep, an acre or forty-three thousand five hundred and sixty square feet will contain twenty-one thousand seven hundred and eighty cubic feet, and weigh one million seven hundred and forty-two thousand and four hundred pounds, which is eight hundred and seventy-one tons One per centum of any constituent in the soil, represents seventeen thousand four hundred and twenty-four pounds, which is nearly nine tons, and one-tenth of one per centum is almost one ton to an acre.

From Morton's Cyclopedia of Agriculture, we copy the following table of the weight of different crops grown on an acre, the weight of the ash of the same crops, and the weight of some of the important constituents of the ash. The weights for the Indian corn, red clover and timothy are computed from data in Johnson's "How Crops Grow."

	Whole crop—pounds.	Ash of crop—pounds.	Potash—pounds.	Lime—pounds.	Phosphoric acid—pounds.
Wheat	1,500	25	7	1	11
Wheat straw	3,000	153	18	9	8
Rye	1,400	19	5	1	9
Rye straw	4,200	168	29	15	6
Oats	2,000	58	10	2	11
Oat straw	3,332	170	33	14	4
Beans	1,575	63	23	4	24
Bean straw	2,800	168	89	34	12
Potatoes	17,920	400	223	8	50
Potato tops	10,080	180	50	31	14
Turnips	22,400	340	126	38	33
Turnip tops	13,440	300	76	70	28
Indian corn	3,444	49	14	2	22
Indian cornstalks	4,375	240	85	26	20
Red clover	4,000	268	92	91	27
Timothy hay	4,000	280	81	26	30

The figures in this table open subjects for consideration and study, and the relation which these ash constituents have to each other may suggest notions as to the fertilizers to be applied to different crops. But they also show that even the heaviest of crops does not take for its ashes quite four-hundredths of one per cent. from the weight of the first six inches of soil. A crop of wheat of twenty-five bushels to the acre, removes in the grain and straw only nineteen pounds of phosphoric acid, or one thousand of one per cent. of the weight of the soil. There is then in all the soils we present analyses of, an abundant supply of these constituents of the ash. And yet experience has proved that we cannot get them out fast enough to raise large crops without manures. The manures either supply the needed ash constituents, or dissolve the fertilizing constituents in the soil, or take the place of the substances removed, or in some other way help on the growth of the crop.

The effect of fertilizers on the different classes of soils is not the same. Where commercial fertilizers containing only a single one of the expensive manures is used this can be made to appear, and it will become the interest of the enterprising and skillful farmer to determine it upon his own ground for himself, and then to so prepare, purchase or use his stores of fertilizing material, as to get from them their full value, and to waste nothing.

The commercial fertilizers which cost the most and are the most in demand by farmers are potash ammonia and phosphoric acid. In

nearly all fertilizers one or more of these is to be found, though usually mixed with quantities of valueless or low priced substances. The worth of commercial fertilizers is calculated from the amount of the above-mentioned three substances found in them, as ascertained by analysis.

FERTILIZERS.

We give here some analyses and valuations of manures which are in general use. They have been obtained from various sources but chiefly from the laboratory of the Agricultural College.

PRICES USED IN THE VALUATION OF MANURES.

The following prices are substantially those which have been used by the leading agricultural chemists in our country. Professor S. W. Johnson, of New Haven; Professor Peter Collier, of Vermont; S. L. Goodale, Esquire, of Maine; Professor C. A. Goessman, of Massachusetts Agricultural College, Amherst, and others in our own country and abroad have considered these as the nearest approach to the true value of the fertilizing elements of manures that can be made at the present time:

Ammonia per pound	25 cents.
Soluble phosphoric acid per pound	16 "
Reverted phosphoric acid per pound	13 "
Insoluble phosphoric acid per pound	6 "
Potash per pound	7 "

These are the only substances which are considered worth taking into account in estimating the value of commercial manures which sell for more than fifteen dollars a ton. The prices named are for the substances when they are in forms to decay and dissolve quickly and easily. If they will not decay in a reasonable time they are worth less and may be of no value at all. Leather has in it the elements of ammonia, yet it decays so slowly as to be worth nothing for manure. Granite rocks contain a good deal of potash, but their decay is so slow that they are considered of no value for manure. And phosphoric acid is found in many minerals, where it is so solid as to be of no use as a fertilizer. The ammonia in horn, hair and other substances which decay slowly is worth something but not so much as that in guano. Potash in green-sand marl has some value, but not so much as it has in the *soluble potash* of commerce. The phosphoric acid in bones and in green sand marl has some fertilizing effect, but it is not so valuable as the soluble superphosphate of lime.

The price set down for insoluble phosphoric acid is not satisfactory, but it is perhaps as safe as any price we can at present assign.

The phosphoric acid in mineral phosphates such as those found in our iron ores, or even in the Charleston phosphates is but very slightly soluble in weak acids, and would be dear at six cents a pound. And on the contrary that in bones, though considered insoluble, does dissolve in weak acids, so that when in very fine dust it approaches closely in value to that which is called reverted phosphoric acid, being worth more than six cents a pound. It has been found that superphosphate of lime does not always remain constant in its properties, but that some kinds of it change, the phosphoric acid which was soluble when it was first prepared, gradually becoming insoluble in water, though dissolving easily in weak acids. The part that has become insoluble is called *reverted* phosphoric acid.

Other constituents of manures have some value, which in those of lower price will necessarily be taken into the account. Ground gypsum or plaster is worth with us a half cent a pound. Common salt is worth the same price. Lime is worth from a quarter to a half cent a pound; and the carbonaceous or strawy vegetable part of our barnyard manures, though it is not possible for chemists to assign to it a value which will at all show its usefulness on different soils, is indispensable.

Stable Manure.—The chief reliance for manures must still be from the stable and the barnyard, and it is only when a good supply of this kind of manure can be secured that farming can be carried on profitably. I present here for comparison and valuation the analysis of well rotted stable manure. It is copied from Prof. S. W. Johnson's Essay on Manures, p. 81.

ANALYSIS.

Phosphoric acid,	.45
Potash,	.49
Ammonia,	.73
Soda,	.08
Lime,	1 99
Magnesia,	.14
Oxide of iron and alumina,	.67
Sulphuric acid,	.12
Carbonic acid,	1.40
Chlorine,	.02
Soluble silica,	1.68
Sand and earthy matter,	1.01
Organic matter,	15.80
Water,	75.42
	100.00

Valuation for one ton of 2,000 lbs.,

9 lbs. phosphoric acid, at 16c.,	$1 44
9.8 lbs. potash, at 7c.,	68
14.6 lbs. ammonia, at 25c.,	3 65
	$5 77

This is only the estimated value of the three high priced constituents. From the estimate it will be seen that it is worth more than the price usually paid for it.

Peruvian Guano.—The following is the composition and valuation of an average sample of this well-known fertilizer:

ANALYSIS.

Ammonia,	14.8 per cent.
Phosphoric acid,	10.1 "
Potash,	3.0 "

Valuation for one ton,

296 lbs. of ammonia, at 25c.,	$74 00
202 lbs. of phosphoric acid, at 10c.,	20 20
60 lbs. of potash, at 7c.,	4 20
	$98 40

Genuine guano always gives satisfaction, and it finds a ready sale among those who best know the importance of using good fertilizers. Those who have occasion to buy manures can, from the above analyses and estimates, make the comparison of cost of stable manure and guano to suit their own locality and circumstances. For the majority of farmers there is no doubt the stable manure is cheapest, and it has the great advantage of supplying a large amount of strawy material which is so necessary to keep the ground open and lively.

SUPER-PHOSPHATES OF LIME.

Whann's Super-Phosphate.—This is a popular fertilizer, manufactured near Wilmington, Delaware, and is very largely used in the western and southern parts of our State. It is in fine condition for sowing, being admirably prepared.

ANALYSIS.

Soluble phosphoric acid,	5.34
Reverted " "	4.01
Insoluble " "	4.98

Potash,	.40
Ammonia,	3.40
Soda,	3.17
Lime,	15.40
Magnesia,	.47
Oxide of iron and alumina,	1.23
Sulphuric acid,	13.90
Chlorine,	3.50
Organic matter other than ammonia,	23.93
Water,	13.25
Earths insoluble in acids,	9.30
	00.28

Valuation:

66.8 lbs. of soluble phosphoric acid, at 16c.,	$10 69
80.2 lbs. of reverted phosphoric acid, at 13c.,	10 42
99.6 lbs. of insoluble phosphoric acid at 6c.,	5 97
8 lbs. of potash, at 7c.,	56
78 lbs. of ammonia, at 25c.,	19 50
Estimated value of one ton,	$47 14

Russel Coe, of Linden, New Jersey, made for us, last year, superphosphate which contained

12.60 soluble phosphoric acid,
6.30 insoluble " "

Which at the prices given would be per ton,

252 lbs. phosphoric acid, at 16c.,	$40 32
126 " " " at 6c,,	7 56
	$47 88

Coe's super-phosphate, prepared for the general market has some ammonia in it, and is worth more than this. He uses burnt bones as his source of phosphoric acid.

The Manhattan Fertilizing Co. of New York, sell a super-phosphate to which a little dried blood has been added. A sample taken from a dealer's stock in New Brunswick, and analyzed in our laboratory yielded as follows:

ANALYSIS.

Soluble phosphoric acid,	7.98
Reverted phosphoric acid,	0.00
Insoluble phosphoric acid,	2.10
Potash,	1.70
Ammonia,	3.90

Valuation per ton,

159.6 lbs.	soluble phosphoric acid, at 16c	$25 53
42 "	insoluble phosphoric acid, at 6c	2 52
34 "	potash, at 7c	2 38
78 "	ammonia, at 25c	19 50
		$49 93

This fertilizer is made from bones.

Lister's Super-Phosphate.—This is manufactured largely at Newark. An average sample, taken from a large quantity of their stock, gave the following result:

ANALYSIS.

Soluble phosphoric acid,	6.57
Reverted " "	1.54
Insoluble " "	4.71
Ammonia,	1.71
Soda,	3.67
Lime,	14.88
Magnesia,	0.62
Sulphuric acid,	17.73
Insoluble matter,	4.62
Organic matter other than ammonia,	29.55
Water,	14 40
	100.00

Valuation of one ton,

131.4 lbs.	soluble phosphoric acid, at 16c	$21 02
30.8 "	reverted " " at 13c	4 00
94.2 "	insoluble " " at 6c	5 65
34.2 "	ammonia, at 25c	8 55
		$39 22

This super phosphate finds a large sale and is well liked. It is made from bones.

Super-phosphates made by other manufacturers are also largely sold in the State, but we cannot here present other analyses. For want of time we have been obliged to pass over, for this year, any attempt at making out a list of the different ones that are in our markets, as we design to do.

GROUND BONE.

Bone flour, *Bone meal and Ground bone*, are the names given by Messrs. Lister Brothers to different grades of ground bones—the first being the finest, the second intermediate and the third, coarsest.

ANALYSES.

	Bone flour.	Bone meal.	Ground bone.
Phosphoric acid,	10.89	11.73	13.35
Ammonia,	3.26	3.22	3.36
Soda,	5.53	3.12	3.90
Lime,	14.48	15.61	17.64
Magnesia,	.75	.55	.48
Oxide of iron and alumina,	.87	.99	.66
Insoluble matter,	3.56	2.52	2.23
Organic matter other than ammonia,	29.80	28.91	31.78
Sulphuric acid,	8.86	9.75	9.40
Water	22.00	23.60	17.20
	100.00	100.00	100.00

These are all made from raw bones, and more or less animal matter is mixed with them. To keep it from putrifying, nitre cake (sulphate of soda), from the nitric acid works, is mixed with the ground material. This has some effect in softening the bone and rendering it more soluble. Some of the phosphoric acid in each of the specimens is soluble in water, and a much larger quantity is soluble in a solution of citrate of ammonia. Thus the ground bone, in one trial with solution of citrate of ammonia, gave 11.3 per cent. of phosphoric acid, and, in another trial, gave 13.35 per cent. of phosphoric acid. Valuing the ground bone from these results, a ton should be estimated as containing

267.0 lbs. of reverted phosphoric acid, at 13c.,	$34 71
67.2 lbs. of ammonia, at 25c.,	16 80
	$51 51

The selling price is $30 per ton, and the finer qualities are $34 and $40 per ton. They are much liked.

Bone dust, from Peter Cooper's glue factory. A large amount of this fertilizer is sold, and it gives satisfaction.

ANALYSIS.

	Fine.	Coarser.
Phosphoric acid,	28.8	29.6
Lime,	38.1	37.8
Magnesia,	1.2	1.6
Insoluble matter,	.6	1.1
Organic matter and water,	30.9	28.6
	99.6	98.7
Elements of ammonia,	2.3	2.1

Valuation per ton,

676 lbs. of phosphoric acid, at 6c.,	$34 56
46 " of ammonia, at 25c.,	11 50
	$46.06

The fine bone dust when tried in a solution of citrate of ammonia yielded 9 per cent. of phosphoric acid. This estimated at the price of reverted phosphoric acid would increase the above valuation by $6.30, and make it $52.36.

POTASH.

German Potash Salts.—There is a very common and decided opinion among farmers that potash is a valuable fertilizer. The opinion is founded on knowledge of the good effects of wood ashes on crops, and the belief that the potash in the ashes is the cause. The belief is probably not correct, for leached ashes, which contain scarcely anything valuable except fine carbonate of lime, are liked as well as live ashes. Still, as the opinion exists, and potash from the German salt mines has come into market at lower prices than it formerly brought, there is a general desire to know the effect of these salts and how to use them.

ANALYSIS.

Sulphate of potash,	21.88 per cent.
Sulphate of lime,	2.59 "
Sulphate of magnesia,	8.97 "
Chloride of magnesium,	7.37 "
Chloride of sodium,	36.97 "

Insoluble in water,	2.73	"
Water,	19.49	"
Boracic acid, undetermined.		
	100.00	

This contains 11.82 per cent. of potash, and a ton would contain 236.4 pounds of potash. This, at seven cents a pound, is worth $16.52. The other constituents may have some value; if not, these salts sell for more than they are worth.

OTHER MANURES AND WASTE PRODUCTS.

Muck, Peat, Turf, Black Mud.—These are the various names given to the accumulations of vegetable matter which are found in swamps, marshes, and other wet grounds in all parts of our State. Such matter has long been used as a fertilizer, and it still finds a large use in many places. Vineland, Hammonton, Egg Harbor City and many other places are greatly improved in their cultivated lands by its use.

Six specimens, from different parts of the State, on analysis yielded an average of one and one-fourth per cent. of the elements of ammonia. They contained very little potash or phosphoric acid. From forty to eighty per cent. was vegetable matter. If the elements of ammonia were in the proper condition for plant food the twenty-five pounds in a ton would be worth $6.25. But the peat is not in decaying condition, and both skill and time are requisite to fit it for a manure. It needs composting with barnyard manure, lime or wood ashes before it is fit for use. It can be had on many farms for the mere cost of hauling, and as the skill of the farmer can make it worth as much as an equal quantity of the best stable manure, it certainly offers large inducements to use it wherever it can be had.

Green Sand Marl.—Some trials have been made upon marl to test the solubility of its phosphoric acid; Squankum marl, containing four per cent. of phosphoric acid, was digested in a solution of citrate of ammonia, and two per cent., or one half of it, was dissolved; pure crystallized phosphate of lime was ground very fine, and digested in a solution of citrate of ammonia, and scarcely a trace of it dissolved. I think then that the phosphoric acid in the green sand marl must be estimated as worth more than the insoluble phosphoric acid of the manufactured phosphates. In the Annual Report of the Geological Survey for 1870, I computed the value of the marl, assuming nine cents a pound for phosphoric acid, and two cents a pound for potash. From my own observations upon the effects of marl, as well as the experience of some of our best farmers as to its value, I was led to adopt these as fair prices, and I see no reason yet for changing them.

The following table shows the composition of the marls most largely used in New Jersey, and fairly represents the different beds and varieties:

ANALYSES.

	1	2	3	4	5	6	7	8
Phosphoric acid...	1.47	1.60	1.28	2.46	1.34	3.17	4.67	1.14
Sulphuric acid.....	0.00	0.00	1.37	0.17	0.00	0.25	0.51	0.14
Silicic acid.....	50.85	51.10	51.92	57.35	46.82	59.05	52.70	38.70
Carbonic acid.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.13
Potash	5.33	6.46	5.36	4.47	5.59	4.72	3.81	3.65
Lime.....	1.65	2.13	1.68	3.36	2.02	4.65	5.52	9.07
Magnesia.....	2.95	3.85	3.38	2 99	3.10	2.66	2.70	1.50
Alumina.....	6.89	9.15	5.40	5.86	6.48	6.67	8.66	10.20
Oxide of iron.....	21.34	18.20	19.82	15.03	23.93	11.27	15.92	18.63
Water.....	8.40	6.75	8.70	8.20	9.70	7.50	6.40	10.00
Total.....	98.88	99.24	98.91	99.89	98.98	99.94	100.89	99.16

1. Marl from the pits of Dickinson Brothers, Woodstown.
2. " " " " West Jersey Marl Co., Barnsboro.
3. " " " " Pemberton Marl Co., Pemberton.
4. " " " " Vincentown Marl Co., Vincentown.
5. " " " " Cream Ridge Marl Co., Hornerstown.
6. " " " " Squankum Marl Co,, Farmingdale.
7. " " " " Squankum and Freehold Marl Co., Farmingdale.
8. " " " " at Marlboro, Monmouth county.

The computation of the values of these marls, from their phosphoric acid and potash only, shows them to be worth from $3.50 to $8.50 a ton. They are largely used whenever they can be got at prices ranging from $1 to $5 a ton. We have used them on our fields, and always with success. They are specially adapted to grass and clover; but all soils are benefited by them, and I have never yet seen a field worn out that has once been well marled.

Their real value is apparent when they are compared with leached ashes, which sell readily at from twenty cents to twenty-five cents a bushel, or $7 to $8.75 a ton, and are prized by all farmers. An analysis of leached ashes, made by Professor S. W. Johnson, and published in the report of the Connecticut Board of Agriculture for 1873, gives as an average:

1 per cent. of potash,
1 per cent of phosphoric acid,
40 to 50 per cent of carbonate of lime,
35 per cent. of water.

The valuation of one ton of ashes, at the most, is

20 pounds of	potash, at 7 cents, ...	$1 40
20 "	phosphoric acid, at 13 cents, ...	2 60
500 "	carbonate of lime, at ¼ cent, ...	1 25
		$5 26

Marls much richer in all the elements of fertilization than these ashes, are sold for $1.25 a ton. The only difference in favor of ashes is their extreme fineness. They are so fine that they can be spread or scattered completely over the surface, while marl when wet spreads very imperfectly, and is never so fine in its particles as ashes. If marl could be ground in a mill so as to reduce its grains of green sand to fine powder, its immediate value would be doubled. And the mechanical engineer that can make a mill to do this work cheaply and effectually, will confer a great benefit on the agricultural resources of New Jersey. It is much improved in its action by being thoroughly dry so that it can be spread evenly over the whole surface of the ground. It can be effectually dried by mixing it with a little stone lime, and allowing the lime to slack, and so heat and dry the whole mass.

Refuse Hair from Glue Factories.—We have used a large amount of hair manure from the glue factories, with good results. It consists mostly of hair, a little plaster and lime, and some small bones scattered through the mass. The sample we analyzed contained

11.6 per cent. of ammonia,
3.7 per cent. of phosphoric acid,
3.7 per cent. of sulphuric acid,
7.8 per cent. of lime.

The hair decays though quite slowly, even in a fermenting compost, and I estimate the value of its ammonia at 10 cents a pound. The phosphoric acid is in such solid fragments of bone, that I do not consider it of value.

232 pounds of ammonia, at 10 cents per pound, make the ton of hair worth $23.20; its price is $12 a ton. By composting with its own weight of stable manure it is made to decay tolerably fast; it turns black, gives off a powerful stench and becomes quite rotten. We have raised fine crops of cabbage and turnips by its use. Composted with marl and barnyard manure it makes an excellent top dressing for grass.

There is perhaps no other commercial manure as cheap as this is. Its smell and the difficulty of rotting it, are the principal objections to its use.

Malt Dust, or Malt Screenings.—We have used this substance as a top dressing on our grass lands, with remarkably good results. It is mostly sold to be fed to cattle, and is a rich food. It is light and bulky, so that it will not pay for long transportation. A bushel weighs 20 pounds, and usually sells for about 20 cents.

We present our analysis so that its composition may be seen, and as it is in good condition for spreading directly on the ground, and decays fast enough, we put the full prices on its fertilizing constituents:

ANALYSIS.

Phosphoric acid,	1.73
Potash,	2.19
Ammonia,	5.60
Soda,	.20
Lime,	.23
Magnesia,	.23
Oxide of iron and alumina,	.17
Sulphuric acid,	.62
Chlorine,	.04
Silica and earthy matter,	1.50
Organic matter besides ammonia,	80.09
Water,	7.40
	100.00

Estimated value of one ton or 100 bushels:

34.6 lbs.	phosphoric acid, at 16c.,	$5 53
43.8 "	potash, at 7c.,	3 08
112.0 "	ammonia, at 25c.,	28 00
		$36 61

When spread on grass land to the amount of 25 bushels or more per acre, its effects can be seen within two weeks, and it acts much like barnyard manure. It is so convenient to apply, not in any way disagreeable, and withal of so moderate a price that it ought to be more highly appreciated than it now is.

Poudrette.—Dried night soil, prepared without addition of earth or other absorbent, and containing only a little ashes, rubbish and such matters as are thrown into privy-vaults, has been much used in our vicinity, and I here present an analysis and valuation for comparison with other manures offered for sale. An average sample contained

2.23 per cent. of phosphoric acid,
.07 per cent. of potash,
1.11 per cent. of ammonia,

and a ton would contain

44.6 lbs.	of phosphoric acid, at 16c.,	$7 13
1.4 "	of potash, at 7c.,	10
22.2 "	of ammonia, at 25c.,	5 55
	Value of one ton,	$12 78

It is sold for 30 cents the bushel of 50 pounds, which makes the price per ton $12. It is quick in its action, and experience shows it to be specially favorable to the growth of cabbage. The extreme fineness of the components undoubtedly enables it to produce its effects mainly in the first season of its application.

Cancerine and Fish Guano.—Cancerine is a manure made by drying the common kingcrab or horsefoot, and grinding it in a mill; and fish guano is made from the moss-bunker or menhaden by steaming the fish, pressing out the oil, and then drying and grinding the residuum. The following are the analyses of these substances—(1) is the cancerine, (2) the fish guano:

ANALYSES.

	(1)	(2)
Water,	9.32	
Organic matter and loss,	70.87	78.30
Lime,	4.36	8.67
Phosphoric acid,	2.71	7.78
Sulphuric acid,	5.17	
Silicic acid,	3.88	1.33
Potash,	3.69	1.54
Soda,		1.02
Magnesia,		0.67
Chlorine,		0.69
	100.00	100.00

	(1)	(2)
Ammonia,	10.7	9.28

Valuation of one ton of cancerine:

215 pounds of ammonia. at 15 cents,	$32.25
54 " " phosphoric acid, at 13 cents,	7.02
36 " " potash, at 7 cents,	2.52
	$41.7

Valuation of one ton of fish guano:

185 pounds of ammonia, at 20 cents,	$37.00
155 " " phosphoric acid, at 13 cents,	20.15
20 " " potash, at 7 cents,	1.40
	$58.55

The price of the ammonia is put below that in the guano, because the fertilizers are not so soluble, or in such fine powder. The valuation of the fish guano is still too high, as the specimen examined was quite dry, while that sent into market contains a considerable percentage of water.

The cancerine is made in Cape May, and is readily sold to farmers at $25 a ton. It is used on wheat and to some extent on other crops, and all the experience in regard to it, is that, two tons of it are as good as, if not a little better than, one ton of guano. The quantity made is limited by the annual supply of crabs to about 500 tons. For wheat raising it is a much cheaper fertilizer than guano. The analysis, however, shows a deficiency of lime and phosphoric acid, and it is everywhere observed that clover does not thrive after it, while timothy grows most luxuriantly. Composting it with some of the super-phosphates would undoubtedly increase the fertilizing power of both substances.

The fish guano has been made at several places along the sea shore. The supply of material is almost unlimited, and it only needs capital and skill to build up a business of great importance to the State and profit to the manufacturer. On the coast of Long Island, and of Maine, where the business has been carried on for the oil which could be got from the fish, the residuum has been sold at various prices from $15 to $30 a ton, and has been a very popular fertilizer with those who have used it. It is sought for by the manufacturers of super-phosphate of lime, to mix with their product, and there can be no doubt that it is very beneficial in such a mixture, giving quickness to its action while the super-phosphate would add to the duration of efficiency. When this source of manure is properly worked, it can be made to supply all the guano needed in the State.

Manures which are cheap, quick in their action, and adapted to the soil and the crop to be grown, are the great need of the farmers, gardeners, and fruit-growers of New Jersey. Barn yard manure, clover and other green crops, peat, green-sand marl and lime are the cheapest and most abundant. Refuse and waste matters from our great manufacturing and commercial centres are more accessible to our farmers than to most others, and intelligent men can profitably avail themselves of their advantages in this respect. Spoiled flour and meal, tainted meat and fish, refuse from slaughter-houses and rendering establishments, screenings and dust from mills, elevators, and malt-houses, ashes, shoddy, lime, &c., from factories of all sorts, may often be secured at a cost by far less than their real value. Along our tide waters too there is an unfailing supply of marsh-mud, sedge, sea-weed, mussels, fish, oyster-shells, &c., all of which can be turned to account in enriching the soil.

STATISTICS AND PRODUCTS OF AGRICULTURE IN 1870, FROM THE U. S. CENSUS REPORT.

	Sussex.	Warren.	Bergen.	Passaic.	Morris.	Somerset.	Hunterdon.
Area of the Counties in Acres.....	319,968	220,128	147,622	123,322	309,581	195,654	280,006
Acres of land in or attached to farms—Improved.....	157,403	155,939	69,082	46,253	130,204	157,276	223,059
Acres of land in or attached to farms—Unimproved.....	74,181	37,166	36,064	49,430	98,171	16,772	38,896
Cash value of farms and implements, in dollars .....$	13,264,703	16,415,862	19,554,459	7,280,889	15,382,390	17,881,412	22,708,300
Total value of products and betterments.....$	2,526,710	2,710,115	1,405,968	653,829	2,127,231	2,731,190	3,885,830
Orchard Products.....$	39,701	41,320	49.415	6,173	95,523	45,437	268,291
Market garden products.....$	2,624	9,618	240,462	39,415	20,847	4,128	5,305
Value of animals slaughtered or sold for slaughter.....$	321,995	386,104	98,467	48,750	264,674	471,822	729,803
Value of all live stock.....$	1,660 947	1,557,812	842.958	525,908	1,401,712	1,524,405	2,357,936
Horses.....Number	4,230	6,020	3,535	1,539	5,170	6,263	9,520
Mules..... "	171	282	292	179	316	638	689
Milch Cows..... "	17,376	9,145	4,076	3,299	8,595	9,992	12,983
Working Oxen..... "	502	48	513	704	808	168	119
Other Cattle..... "	4,836	4,274	1,348	1,698	5,075	4,754	7,479
Sheep..... "	3,976	14,362	473	1,886	8,770	7,302	22.790
Swine..... "	14,414	12,501	2,953	1,694	7,046	7,883	15,311
Wheat.....Bushels	64,532	295,802	8,788	2,722	80,897	218,766	340,393
Rye..... "	105,306	84,252	31,719	15,223	23,776	12,872	26,799
Indian Corn..... "	432,776	747,951	146,140	68,407	608,024	561,136	1,021,251
Oats..... "	268,477	322,804	45,533	36,467	290,721	700,515	902,737
Buckwheat..... "	72,870	72,858	24 009	13,308	49,764	6,731	41,527
Tobacco.....Pounds	50	.....	5,305	400	825	.....	.....
Wool..... "	11,959	45 557	706	6,487	18,361	22,457	67,863
Peas and Beans.....Bushels	179	24	5,022	237	268	25	366
Irish Potatoes..... "	81,006	81,823	209,162	87,950	168,611	86,684	86,807
Sweet Potatoes..... "	.....	131	135	.....	273	.....	526
Butter.....Pounds	1,455.788	867,831	323,919	159,418	535,274	587,093	965,243
Cheese..... "	.....	....	400	.....	800	.....	.....
Milk.....Gallons	1,317,791	18,511	147,906	244,422	350,891	131,437	594,568
Hay.....Tons	40,335	26,401	18,208	11,396	34,859	42,034	38,110
Clover Seed..... .....Bushels	406	1,894	45	42	1,058	5,125	6.894
Grass Seed..... ..... "	161	154	862	17	13	1,059	1,800
Honey.....Pounds	7,571	4,142	4,770	3,981	5,167	1,324	8,585

STATISTICS AND PRODUCTS OF AGRICULTURE IN 1870, FROM THE U. S. CENSUS REPORT.

	Hudson.	Essex.	Union.	Middlesex.	Mercer.	Monmouth.	Burlington.
Area of the Counties in Acres.....	28,051	78,852	67,097	192,314	141,844	289,625	551,533
Acres of land in or attached to farms—Improved.....	1,762	20,964	27,349	115,621	108,400	156,777	180,775
Acres of land in or attached to farms—Unimproved.....	973	13,441	9,859	41,466	20,179	46,300	87,173
Cash value of farms and implements, in dollars..... $	3,207,880	8,946,815	9,014,500	17,443,904	14,615,261	22,969,725	24,359,248
Total value of products and betterments ..... $	312,920	806,638	684,898	2,178,202	2,332,203	3,736,215	4,908,839
Orchard Products..... $	2,120	20,575	13,175	55,318	65,281	154,293	124,114
Market garden products..... $	213,050	137,220	25,615	155,590	84,003	362,213	660,576
Value of animals slaughtered or sold for slaughter..... $	880	64,326	57,267	248,150	426,210	622,745	1,403,143
Value of all live stock..... $	73,487	403,680	373,351	1,206,797	1,195,593	1,711,606	2,229,183
Horses..... Number	252	1,426	1,428	4,888	4,464	6,035	6,407
Mules..... "	7	23	35	719	680	1,254	1,288
Milch Cows..... "	335	2,858	2,780	6,135	6,801	8,033	14,796
Working Oxen..... "	7	191	163	223	42	55	81
Other Cattle..... "	36	1,057	736	3,505	3,487	4,189	3,671
Sheep..... "	3	114	460	3,449	9,384	14,099	16,690
Swine..... "	263	1,164	1,116	6,453	6,738	10,890	15,760
Wheat..... Bushels	300	7,579	5,339	106,158	149,238	176,473	200,120
Rye..... "	597	6,249	4,215	15,967	16,505	46,567	102,411
Indian Corn..... "	2,575	66,192	94,618	423,843	545,547	760,479	983,879
Oats..... "	942	22,107	36,948	271,332	428,143	180,461	175,738
Buckwheat..... "	20	4,049	4,312	11,772	11,415	3,282	11,251
Tobacco..... Pounds	.....	3,012	.....	.....	17,516	.....	13,533
Wool..... "	.....	.....	355	8,639	25,425	41,582	47,247
Peas and Beans..... Bushels	1,190	218	405	877	26	878	6,671
Irish Potatoes..... "	2,534	73,060	61,544	248,830	222,207	1,263,403	581,955
Sweet Potatoes..... "	.....	20	.....	12,391	9,724	50,892	114,517
Butter..... Pounds	950	125,213	114,763	418,434	500,342	415,367	494,769
Cheese..... "	.....	.....	50	2,840	2,095	400	14,710
Milk..... Gallons	48,982	597,624	618,533	192,389	209,837	119,539	359,566
Hay..... Tons	607	11,328	10,879	37,160	28,767	32,389	58,165
Clover Seed..... Bushels	.....	.....	15	1,595	1,511	151	45
Grass Seed..... "	.....	.....	10	71	464	733	.....
Honey ..... Pounds	.....	1,032	1,115	2,453	1,682	3,365	3,596

STATISTICS AND PRODUCTS OF AGRICULTURE IN 1870, FROM THE U. S. CENSUS REPORT.

	Camden.	Gloucester.	Salem.	Ocean.	Atlantic.	Cumberland.	Cape May.	Total.
Area of the Counties in Acres	176,185	162,605	222,701	437,268	403,462	330,080	170,171	4,849,069
Acres of land in or attached to farms—Improved	67,739	98,122	122,021	23,653	18,432	74,241	21,402	1,976,474
Acres of land in or attached to farms—Unimproved	45,560	26,136	55,999	105,673	123,169	66,333	20,096	1,013,037
Cash value of farms and implements, in dollars...$	9,092,469	11,257,245	14,114,175	3,312,229	2,659,969	9,859,807	1,719,315	265,411,367
Total value of products and betterments...$	2,072,298	3,161,117	2,991,792	563,770	361,918	2,254,906	318,609	42,725,198
Orchard Products...$	43,652	64,186	67,614	10,199	11,719	173,857	3,319	1,295,282
Market garden products...$	514,075	249,063	18,159	7,283	79,214	130,140	19,650	2,978,250
Value of animals slaught'rd or sold for slaughter...$	306,653	469,594	623,125	92,372	34,651	268,692	42,769	6,982,162
Value of all live stock...$	708,479	974,159	1,227,814	286,995	153,168	831,735	196,100	21,443,468
Horses...Number	2,838	4,574	5,155	982	727	3,439	816	79,708
Mules... "	543	348	630	346	95	314	4	8,853
Milch Cows... "	4,555	5,523	7,352	1,755	953	4,444	1,545	133,331
Working Oxen... "	13	6	10	70	36	58	13	3,830
Other Cattle... "	1,161	2,409	3,986	1,278	731	3,314	1,303	60,327
Sheep... "	990	2,704	6,668	1,470	274	3,821	382	120,907
Swine... "	6,875	10,382	9,836	2,387	1,507	5,639	1,751	142,563
Wheat...Bushels	85,284	123,181	259,777	9,273	7,198	140,549	19,064	2,301,433
Rye... "	27,036	20,334	5,345	13,768	3,349	4,314	171	566,775
Indian Corn... "	320,774	457,236	756,342	106,969	47,418	507,539	86,218	8,745,384
Oats... "	17,808	27,543	164,678	10,228	1,921	98,079	6,648	4,009,830
Buckwheat... "	829	4,244	5,957	3,380	1,492	10,756	157	353,983
Tobacco...Pounds	...	...	200	...	...	...	...	40,871
Wool... "	3,210	8,122	11,658	4,425	199	11,262	1,095	336,609
Peas and Beans...Bushels	18,742	9,018	1,333	740	481	7,930	1,591	56,221
Irish Potatoes... "	376,369	411,872	350,955	52,719	31,702	203,886	22,360	4,705,439
Sweet Potatoes... "	113,523	762,624	220,574	8,760	18,514	216,987	21,193	1,550,784
Butter...Pounds	206,775	334,574	378,849	75,926	33 036	209,140	68,319	8,266,023
Cheese... "	2,349	4,200	7,820	2,390	...	175	...	38,229
Milk...Gallons	233,414	15,126	27,631	14,561	8,456	90,156	32,080	5.373,323
Hay...Tons	16,389	27,805	39,454	7,348	4,675	27,712	7,954	521,975
Clover Seed...Bushels	28	503	3,903	91	...	3,019	...	26,306
Grass Seed... "	...	4	67,496	2	...	151	...	72,401
Honey...Pounds	1 262	3,352	1,187	2,291	1,045	2,821	25	60,636

The following table gives the value, in dollars, of the whole yearly product per acre of our farm lands by counties; also the value per acre in the township in each county which has yielded the largest product.

Counties.		Townships.	
Sussex	$16	Sparta,	$20
Warren,	17	Lopatcong,	24
Morris,	16	Morris,	23
Passaic,	14	Manchester,	35
Bergen,	20	Saddle River,	34
Hudson,	177	*	
Essex,	38	East Orange,	124
Union,	25	Union,	42
Middlesex,	19	Madison,†	26
Somerset,	17	Franklin,	20
Hunterdon,	17	Tewksbury,	23
Mercer,	21	Ewing,	32
Monmouth,	24	Holmdel,	37
Ocean,‡	24	Plumstead,	25
Burlington,	27	Beverly,	60
Camden,	30	Stockton,	55
Gloucester,	32	Deptford,	47
Salem,	24	Mannington,	29
Cumberland,	30	Landis,	54
Atlantic,	19		
Cape May,	15		
State,	$21.60		

* In Hudson and Atlantic counties no statistics of townships are given in the United States Census Report of 1870. In Cape May only Middle township is given.
† According to the census this has the maximum product per acre, but this is probably incorrect.
‡ Several townships are wanting in Ocean county.

The above table, by counties, fails to exhibit the average value of the yearly productions per acre in the more natural subdivisions of the State, as marked by certain characters of soil and geological structure. This is owing to the arbitrary county lines not conforming to the boundaries of these rock and soil formations. An examination, by townships, on the several well-marked soil divisions of the State brings out some differences not apparent in the table of counties. It also shows a great degree of uniformity throughout the several districts of the State, as thus divided, excepting in some of the townships near the cities, where fruit culture and market gardening very greatly increase the value of the productions per acre.

In the great Kittatinny Valley of Sussex and Warren counties the average per acre, on the slate soils, is from fourteen to nineteen dollars. Wantage, in Sussex, a representative, giving seventeen

dollars. The townships on the magnesian limestone outcrop stand higher, the range being from eighteen to twenty-four dollars to the acre. Thus, in Warren county, the average of Washington, Franklin, Greenwich and Lopatcong is twenty-two dollars. These townships include within their limits the best portions of the Musconetcong and Pohatcong valleys, from Washington to Phillipsburg.

The gneiss soils of the Highlands average eighteen dollars an acre in Chester, Morris county, and nineteen dollars in Lebanon, in Hunterdon county, almost entirely on these soils, and the best representatives of them.

The red shale and sandstone country, occupying the greater portion of Bergen, Essex, Union, Somerset and Hunterdon counties shows a greater variation, so that an average of the townships of this district does not fairly represent it. Hudson county gives $177 dollars per acre; East Orange, in Essex, $124. These high figures are the results of nearness to New York, and market gardening being pursued instead of general farming. Taking Somerset and Hunterdon counties together, the average is seventeen dollars, while the range by townships, on the red shale in these counties, is from twelve to twenty-two dollars. In Bergen, Essex and Union counties the average is higher.

The clay and marl districts of the State, including the richest and most productive parts of Monmouth, Burlington, Camden, Gloucester and Salem counties, also shows a wide range among the townships on these formations, and hence an average, representing the whole, is not possible. In Monmouth county, the value per acre, in Holmdel, is $37; in Middletown, $24; in Atlantic, $28; in Shrewsbury, $32; in Marlborough, $31; and in Freehold, $26. These are on the marl outcrop, and they represent fairly the returns for general farming. In Burlington county, Chesterfield, Springfield, Westhampton, Pemberton, Lumberton, Medford and Evesham, together average $26, the range being from $20 to $37. In Gloucester and Salem counties, the average for the townships of Harrison, Mantua, Pilesgrove and Mannington, is $22 to $29 per acre. Along the Delaware river from Burlington to Salem, the average is higher, ranging from $30 to $60.

Southeast of the marl region, the drift and alluvial soils give returns which are equal to the best in the central and northern parts of the State. In Cumberland county, the lowest reported is $23, in Deerfield township. Atlantic county gives $19, and Ocean $24 to the acre. Cape May produces less value per acre— $15.

In comparison with the most productive and most favorably situated districts of New York and Pennsylvania, our soils appear to be quite equal to them. The average value produced per acre in Bucks county, was $26; in Berks, $25; in Lancaster, $25; and in Chester, $22. In Lancaster county, noted for its productiveness, especially for wheat growing. the average of five selected townships, was $35 to

the acre, which is not greater than the best townships in our marl region. The two highest returns, by townships, in Chester county, famed for its dairy farming, are $36 and $37 respectively. In Orange county, New York, in the Wallkill valley, the yearly productions per acre are from $23 to $32, which is a little higher than the limestone and slate soils of Warren and Sussex counties. Where fruit culture and market gardening are pursued, comparisons are not so easily nor fairly made; but according to the census report, the parts of the State devoted to these branches of husbandry, are as productive as the best townships in either New York or Pennsylvania.

IMPROVED AND UNIMPROVED LANDS.

The area of the State, as given in the Geology of New Jersey, is seven thousand five hundred and seventy-six square miles, or four million eight hundred and forty-nine thousand and sixty-nine acres, or excluding the bays, sounds and inlets within its limits, four millions seven hundred and twenty-eight thousand six hundred and nineteen acres. According to the census report for 1870, there was in farms an area of one million nine hundred and seventy-six thousand four hundred and seventy-four acres of improved land—that is, "cleared land used for grazing, grass or tillage, or lying fallow." No farm was reported "of less than three acres, *unless* $500 worth of produce has actually been sold off from it during the year." This rule excluded all lots whether in villages, towns and cities, or elsewhere; and hence the above extent of "improved land" does not include all that is cleared. This difference is very great in the counties of Hudson, Essex and Union where there are over three hundred thousand inhabitants of cities and towns. A carefully prepared estimate of the additional area of cleared surface, or of surface held in lots, amounts to an aggregate of one hundred and twenty-eight thousand acres, making a total of two million one hundred and four thousand four hundred and seventy-four acres. The improved land in farms includes about one-fourth of the tide marsh area, or about seventy-five thousand acres, leaving two hundred and twenty-five thousand acres of marsh as unimproved, outside of farms. This added to the above area of *cleared surface*, makes a grand total of two million three hundred and twenty-nine thousand four hundred and seventy-four acres destitute of wood. Deducting this from the *land area* of the State (four million seven hundred and twenty-eight thousand six hundred and nineteen acres), there remains two million three hundred and ninety-nine thousand one hundred and forty-five acres, or in round numbers, two million four hundred thousand acres of unimproved up land which may be considered as woodland, amounting to one-half of the total area of the State. The geographical distribution of this woodland in the several counties of the State, is given in the following table:

TABLE.

Counties.	Woodland. Acres.	Woodland in Farms. Acres.	Woodland not in Farms. Acres.*	Percentage of total area in Woodland.
Sussex	160,000	67,673	92,000	50
Warren	61,000	27,758	33,000	28
Morris	176,000	73,009	103,000	57
Passaic	73,000	48,636	24,000	69
Bergen	61,000	25,719	35,000	41
Hudson	316	316	.....	1
Essex	22,000	6,221	16,000	21
Union	14,000	7,485	6,000	21
Middlesex	68,000	24,450	44,000	35
Somerset	36,000	14,507	22,000	18
Hunterdon	53,000	32,105	21,000	19
Mercer	29,000	12,032	17,000	20
Monmouth	125,000	36,882	88,000	43
Ocean	334,000	52,245	282,000	87
Burlington	335,000	67,022	268,000	62
Camden	103,000	34,805	68,000	59
Gloucester	56,000	14,830	41,000	34
Salem	84,000	22,696	61,000	38
Cumberland	215,000	41,269	174,000	65
Atlantic	312,000	92,506	220,000	86
Cape May	83,000	16,169	67,000	52
	2,400,316	718,335	1,682,000	

According to the census report the woodland in farms was 718,335 acres, distributed in the counties as shown in the second column of the above table. This subtracted from the total woodland area gives 1,681,665 acres not properly included in farms. Nearly all of this is held in large tracts, and as the third column of the same table shows, three-fourths of it is in the counties embracing the highlands of the northern part of the State, and those on the Atlantic sea border in the south. The differences between the total area of woodland and that of the woodland given in the census report, as in farms is so small in Hudson, Essex, Union, Somerset, Hunterdon and Mercer counties that it may be neglected or may be considered as due to the under estimates of farmers in reporting to the census officials. As is well known the extent of woodland outside of farms in these counties is very small. The most natural division of the State is that based upon its geological formations, as these give character not only to the soil but also to its forest covering. Considering the State as thus subdivided into these well marked districts, and beginning at the north end we find in the great valley lying between the Kittatinny or Blue Mountain and the Highlands, and known as the Kitta-

* The totals are given in the nearest thousands, corresponding to the estimate as made for the areas in the first column. The second column is from the census report for 1870.

tinny Valley, about 72 per cent. or nearly three-fourths of the total area is improved and in farms. The fertility of the magnesian limestone and slate soils of this valley has brought such a large proportion of this area into cultivation, leaving only the occasional rocky outcrop in wood. In that part of this valley embraced within the limits of Sussex county the improved land is 70 per cent. of the total area; in Warren county, in the same valley, it is 74 per cent.

The magnesian limestone valleys lying between the Highland ridges are, as all familiar with that country know, quite bare of wood. Thus Franklin and Greenwich townships, Warren county, have only 18 per cent. of their surface unimproved, or about one-sixth in rough and wooded tracts. This is probably not well adapted for tillage and so is left unimproved.

In the Highlands the proportion of woodland to the total area is taken together about 60 per cent., but there is a very great variation from 17 per cent. improved land in that portion of this belt lying north of the Morris and Essex Railroad, to 60 per cent. in the townships of Chester and Washington in Morris county. Towards the southwest the proportion of woodland to the total area is nearly the same as that in Chester, being 55 per cent. The disintegration of the rocks in the southwestern portion of this belt of the Highlands has made a soil easily tilled, and hence the forests have been removed, excepting from the more rocky and rough slopes. And the wood here is nearly all on these slopes, as may be seen on crossing Schooley's, Musconetcong, Scott's, and other mountain ridges of this formation. In this highland range the forest area is about 300,000 acres. The total area of woodland in the highlands and that part of the State north of this mountain belt, including the counties of Sussex, Warren, nearly all of Morris, and portions of Passaic, Bergen, Somerset and Hunterdon, is about 490,000 acres.

Proceeding southward, the next great and well marked division of the State is known as the Triassic Formation, or the red sandstone and shale with its ridges of trap rock. In this belt there are about 1,000,000 acres. The proportion of forest is less than in any other district of the State, the improved land ranging from 72 per cent. of the whole surface, (leaving 18 do. for forest) in Washington and Saddle River townships in Bergen county, to 84.7 per cent. in Bedminster, Bridgewater, Franklin, Hillsborough and Branchburg townships in Somerset county. In Bedminster, Branchburg, and Montgomery townships in Somerset county, and Raritan, Readington and Delaware townships in Hunterdon, in which there are no trap outcrops of extent, the improved land, or that cleared is 93.6 per cent. of the surface, leaving only 6.4 per cent. of unimproved land of all sorts, and showing that the woodland of this belt is limited to the rough trap ridges. The whole extent of the forests in this belt is 210,000 acres. Of this probably more than one-half is on the trap ridges, leaving less than 100,000 acres in the red shale and

sand stone districts. Of the whole belt but little over one-fifth is unimproved, and much of this consists of uneven rough surface not suited for cultivation, and scarcely to be considered as valuable woodland. These figures also show the very marked difference between this and the Highland belt which borders it on the north.

South of the red shale formation are the clay and marl districts, stretching in a wide belt across the State and having within their borders about 1,000,000 acres. Of this about 400,000 acres is unimproved (woodland). There is not the same uniformity in this subdivision of the State as in the red shale country, as the soil varies from coarse sand to the heaviest clay, and the clearing has been on the more fertile, leaving the lighter and more sandy portions in woods. Thus in Middletown, Holmdel, and Upper Freehold, three townships on the marl outcrop in Monmouth county, the improved, or cleared surface is 83.5 per cent. of the whole, while that portion of Mercer county in this division has only 68.7 per cent. cleared. Parts of Middlesex and Monmouth southeast of the Camden and Amboy Railroad line have not over one-half of the area cleared. In Burlington county the proportion improved ranges from 87 per cent. in Chester township to 65 per cent. in Cinnaminson, Springfield, Westhampton, Chester and Lumberton townships in the marl district of this county together have 75 per cent. cleared. In Camden and Gloucester counties the proportion of cleared surface in the bounds of this geological formation is about eight-tenths of the whole. Salem county has in that part of it on this belt less woods than any of the counties above named. Pilesgrove township having only 4 per cent., and this and Washington township together only 17 per cent. in woodland.

In the country southeast of the marl beds, comprising about one-fourth of Monmouth county, very nearly all of Ocean, three-fifths of Burlington, all of Atlantic and Cape May, two-thirds of Cumberland, one-third of Gloucester and Camden counties, there is about 1,300,000 acres of woodland, or about three-fourths of the whole. The lowest per centage of woodland is in some of the townships of Cumberland county, and the highest in Atlantic county. Deerfield, Hopewell, Stoe Creek and Greenwich township in Cumberland together have 45 per cent. in woods, while in Ocean county the woodland amounts to 94 per cent., and in Atlantic it is 95 per cent. of the whole surface. The very large portion of this not in farms is shown by the preceding table of woodland areas. Until quite recently there were over a dozen tracts, each containing more than 20,000 acres in this part of the State, and nearly the whole of these were in timber.

These figures show a large area of uncleared land in the State, but not very regularly distributed. On the Highlands in the north, and in the broad district between the marl beds and the ocean, in the southern end, the proportion of the woodland is in excess of the cleared areas, while in the limestone valleys, the red shale country,

and the marl region, the most of the surface is under cultivation. And in these districts the proportion of woodland is as small as in many parts of Europe. On the red shale the percentage of forest is but little greater than that of either England, Holland or Spain, while it is less than that of France, Italy, Belgium or Germany. And in this part of the State, as also in the limestone valleys of Warren county, the minimum area of forest has been almost reached, as the unimproved areas are nearly all lands unfit for cultivation. In many cases the profits from wood culture may be quite equal to the returns from tillage or pasturage, so that it may be economy to retain this percentage of the total surface in timber. In the marl region there are large areas which could be quite as profitably directed to the production of locust, or other valuable timber, as to that of crops, although the wood supply there is still equal to all present demands for fencing, railroads, and other uses, from our native woods.

The great and almost unbroken forest lands of the State are south of the marl region, in Ocean, Burlington, Camden, Gloucester, Cumberland and Atlantic counties. In this part of the State the improved lands form a narrow border along the sea shore and in the valleys of the streams, and here and there settlements along the railroad lines which traverse this region. Nearly all of the original growth of timber in this country has been cut off, having been used for making charcoal for the iron furnaces formerly at work. Since the decline of this industry, the wood has mainly gone to meet the demands for fuel in New York, Philadelphia, and other neighboring markets.

GEO. H. COOK, *Secretary.*

State Agricultural College,
New Brunswick, N. J.,
February, 10, 1874.

APPENDIX.

ON CULTIVATING THE LOCUST TREE FOR TIMBER.

BY PROF. J. C. SMOCK.

The locust tree, or *Robinia pseud-acacia* of the botanists, is a native of North America, indigenous to the Middle States and the more northern portion of the Southern States, and sometimes seen as far north as Upper Canada. It does not form extensive woods by itself, but occurs singly, or in small groups, among the other more common forest trees of the districts in which it is a native. The cultivation of this tree for timber or for ornamental purposes, has extended its range from Massachusetts quite to Louisiana in our country, into many parts of Canada, and quite generally throughout England and other countries of Europe.

It has a straight stem bearing quite irregular and rather naked branches, clothed with pinnate leaves, which consist of nine to seven-een oblong-ovate leaflets, and, in their season, with hanging bunches or *racemes* of pinkish white to white flowers. When grown in groves or plantations, or in our native forests with other trees, its stem is very straight, and attains a height of sixty to eighty feet, and is almost entirely naked. But in more open situations it spreads out wider, and forms an irregularly shaped top, pleasing, however, on account of its light-green foliage and its showy flowers. The bark of the trunk is rough and rather deeply furrowed, and its wood is greenish yellow to white, and very close-grained. The flowers appear late in spring, or early in the summer, and are very fragrant. The seeds are in flat, pea-shaped pods, and ripen in October. The tree grows rapidly, its shoots sometimes adding eight to ten feet to their length in one season. It is remarkable for the length and number of its roots, and for the great tendency which these have of throwing up *suckers* or *sprouts*, and at great distances from the tree.

In New Jersey and on Long Island there are two varieties, known as the white and the yellow locust, so called from the color of the heart wood. Some have considered this variation to be due to the character of the soil; but this is not the case, as in Monmouth county both are seen on the same kind of soil, and in close proximity. The yellow locust is much more durable wood than the white variety, and

the trees of the former do not *generally* produce so much seed as the latter, although this distinction is not so characteristic, as the production of both flowers and seed, in both varieties, depends more upon the season than upon any inherent difference.

The cultivation of the locust is most profitable upon rich and loamy soils, or at least upon soils underlaid by a good subsoil. And on such bottom it grows more rapidly, and does not appear to be so much injured by the attacks of the borer. Its rapid growth is especially noticeable in the greensand marl district of our State, whenever its roots and innumerable rootlets can penetrate the marl. The red sand bed of the same geological formation also appears to be favorable to its growth. And any soil, underlaid by a tolerably stiff subsoil, is adapted to it, provided it is not too wet. Marshy grounds and wet meadows are unsuitable, although it will live even in such places. While it does not grow so vigorously upon light and poor soils, sometimes hardly fast enough to overcome the borer, such soils are improved by it. This appears to be due to its less dense foliage, allowing a free circulation of the air and admitting the sun's rays, so that the decomposition of the leaf mould is very rapid, and the native grasses form a quite thick sod. The value of this leaf mould is evident from the following analysis of the dry leaves, gathered in December, in a grove near Holmdel, Monmouth county:

Organic matter and water,	87.93
Ash,	12.07
	100.00
Ammonia,	2.59

The ash contained:

Earthy matters, insoluble in acids,	7.30
Alumina and oxide of iron,	1.23
Carbonate of lime,	2.90
Magnesia,	.30
Phosphoric acid,	traces
Alkalies,	"

The lime is unusually large, amounting to nearly one-quarter of the ash or about three per cent. of the dry leaves. In more open groves the grasses form a very smooth and thick sod, provided a little care is taken to keep down the briars and weeds; but where the trees stand closer together the sod is not so fine and the denser shade favors their growth.

The propagation of the locust may be by planting the seeds or by transplanting the sprouts or suckers, which are always to be had near old or large trees. If the seeds are used it is advisable to

soak them in hot water before planting, as this hastens the sprouting. Thus prepared they may be sowed early in the Spring, in drills three feet apart, allowing four or five inches between the seedlings. During the first season these will attain a height of six to fifteen inches. They may be transplanted the second Summer to their permanent location. Sometimes the seeds are sown on the ground where they are to remain, thus avoiding transplanting. The plants from the seed do not grow so rapidly nor vigorously as the sprouts from the stumps of a previous generation, and the abundance of such sprouts generally suffices for the demand without planting the seed. It is advisable to plant close, as a thick growth furnishes a taller trunk, and the borer is not so destructive in a nursery or grove as in the case of trees standing alone, sunlight appearing to favor this insect. If too close, however, some will die, and so create unequal gaps; or, if living, the trees are apt to be too spindling and then easily broken by wind. Intervals of six to ten feet between the trees appear to be the best. The sprouts should not be set out in woods or in newly-cleared grounds where other native and more hardy trees are to grow with them, as some of these soon outstrip and shade them, unless great care be taken to thin out and keep down the more rapidly-growing forest trees. Inattention to this circumstance has caused the failure in many experiments in the cultivation of the locust.

Upon rich bottoms, where the trees grow rapidly, they may be cut when thirty years old, although they will continue vigorous and thrifty until forty or even sixty years of age. But the yield of wood is greater when the cuttings are at intervals of thirty to forty years than from longer growth, although for certain purposes the larger size of the older trees may be necessary.

Under favorable circumstances 30 years will produce trees 50 feet high, having a trunk from 18 to 20 inches in diameter.

The cultivation of the locust in New Jersey has been limited to the central and southern portions of the State, the trees being rarely seen in the northern portion, except in door-yards and along streets as ornamental. The largest and most thrifty groves are seen in Monmouth county, in the townships of Holmdel, Atlantic, Marlborough and Freehold. One of the largest and oldest of these is on the farm of Hon. William H. Hendrickson, near Middletown, in that county. This occupies the site of a native forest, the trees of the latter having been thinned out so as to allow the growth of the locust sprouts set out among the younger trees of the woods. Growing up with these, the locusts did not branch out so much, and the stems are nearly all very straight and tall. Some of them are eighty feet high, and with scarcely any limbs, except a few at the top. Such trunks would make a large number of fencing posts, and are therefore very valuable. On the same farm there are about twenty acres exclusively in locust timber about twenty-five years old, where tilled ground was set with the sprouts from the older

woods. In these the trees are about ten feet apart and from forty to sixty feet high, measuring about eight inches across at the ground. Near the mansion house there are two trees sixty-seven years old, whose greatest diameter averages two and a half feet. Other thrifty and large groves of the locust are on the farms of Lafayette Schanck and Isaac G. Smock, in Atlantic township, one mile south of Holmdel. On the farm of the latter there are several acres of bank and meadow land not easily tillable, covered with growths of locust fifteen to forty-five years old. These are from sprouts set at irregular distances apart, but the average area per tree is seventy square feet. The average height is thirty feet and the diameter six inches in the case of trees fifteen years old. In the older grove, planted forty-five years ago, the spaces are wider and the height ranges from forty to sixty feet, with a diameter of twelve to fourteen inches. In each of these localities the marl beds are within the reach of the roots, and this may explain the rapid and thrifty growth here observed.

On the farm of J. F. T. Forman, near Freehold, there are two hundred trees, grown from seed planted in 1835 and set along the road four feet apart, which will average five feet in circumference, measured near the ground. Some of them Mr. Forman estimates as large enough to cut thirty posts each.

The largest use of the wood of the locust is for fencing material, either as posts or stakes. For posts the cuts vary from $7\frac{1}{4}$ to $7\frac{1}{2}$ feet in length. The breadth ought to be at least six inches to give a margin after holeing. They should be two inches thick at the top, and from two to three inches at the bottom. To furnish such a cut the log must be six inches across. A large tree will allow of from four to six cuts, and of these the first may be large enough to make seven or eight posts, or in all at least twenty posts. The smaller cuts and some of the limbs can be sawed into garden or picket-fence posts, and the still smaller or more crooked branches answer for stakes. Holed posts are valued at fifty to seventy-five cents each; garden fence posts at twenty-five cents each; fencing stakes at five cents a piece. From these figures the value of locust timber is at once apparent. Assuming that there are five hundred trees on an acre, (and this is not a high estimate), and that these are large enough to make twelve posts, each worth fifty cents apiece, the aggregate amounts to $3,000. A grove of quite large and thrifty trees, thirty-six to thirty-eight years old, but not so close as the above estimated on the farm of Daniel Coon near Holmdel, cut off two years ago, averaged sixteen hundred fence posts to the acre, which sold at seventy-five cents each making $1200.

Instances are known where 600 fence posts have been cut from an eighth of an acre, which is equivalent to 4,800 or $2,400 per acre. These figures are based upon a growth of thirty years. Gross returns at the rate of $2,000 to an acre are not uncommon in Monmouth county. From this there are to be deducted the cost of planting and

the expenses of cutting and preparing the timber for market. These items of expense are in part paid by the smaller posts, and stakes and the firewood, and sometimes by the pasturage afforded during the later years of growth. Thus far the locust has been considered as valuable for fencing timber, but the same admirable qualities which fit it for this purpose render it equally desirable to shipbuilders and all needing a strong and durable wood. Its high price has prevented a more extensive use. In durability it is almost unsurpassed, lasting in the form of fence posts for a generation at least. It is also the strongest of all our woods, equalled only by some of the more valuable foreign woods as lancewood and the mahogany. With the strain or tension in the direction of its fibres it will hold nearly double the weight supported by the chestnut, and fifty per cent. more than the oak. Tried transversely or across the fibre its resistance is greater than that of any of our native woods, being to that of the oak as 100 to 75. The locust is also more elastic than the oak. On account of its density and durability the locust would make the best of railroad ties, lasting three times as long as the chestnut or oak now so generally used. At present the price is too high for such uses, but it is to be hoped that the extension of our locust area will soon meet the large demand of our railroad companies which is now so rapidly devouring our native forests. These combined qualities make it our most valuable timber, and one that ought to be used in many places where we now employ oak, chestnut, hickory and other inferior sorts.

The locust tree is well fitted through its widespread network of strong roots and rootlets for localities subject to washes or slides. In the southern and central parts of the State where there is no rocky shaleton to hold the surface beds, and where the heavy rains cut so deeply into the soft and earthy strata, making unsightly gullies or even deep ravines, such a conservative agent is very necessary. The removal of the natural forest covering demands in many cases such a substitute. And for this the locust is almost equal to the willow. There are thousands of acres of such surface, which have been cleared, or ought to be cleared of the native wood and thickets of undergrowth generally found in such places and which are not adapted to tillage or pasturage, that could be planted with the locust and so made almost as productive as the upland areas. Those who may have seen the wild ravines and uneven grounds in Monmouth county thus transformed into beautiful groves, can fully appreciate the value of this tree for such localities. Lands almost non-productive are made to return a good rate of interest upon a valuation equal to that of the average tillable areas.

As an ornamental tree the locust is surpassed by few of our deciduous trees. The pleasing green of its foliage and the beauty of its clustered flowers make it attractive, and form an agreeable variety either in small groups or when set singly among our native or foreign ornamental trees. On account of its less dense foliage it may be

planted in pasture fields, affording the requisite shade for stock in hot summer weather, or it is still more admirably fitted for the sides of streets and roads, neither shading the fields to an injurious extent, nor the road so as to keep them excessively wet. The foreign custom of planting trees on the sides of roads should be more generally followed in our almost tropical summer climate, and we have no other tree which in all respects is so well adapted to this purpose as the locust. The great tendency to sprouts or suckers need not be an objection as these can easily be transplanted to places where they are needed the first year of their appearance, in case tillage does not keep them down.

In view of the rapid diminution of the area of forests in this State and the consequent injurious changes in our climatic phenomena, and also in consequence of the increasing demand for more durable and valuable woods, the cultivation of the locust should be rapidly extended. The small expense and the slight attention needed make the experiment easy of trial, and the profits of successful or thrifty growth are so large as to attract the attention of all landowners. It is not necessary in the interests of climate to surrender areas, now tilled, to forests, or to devote them to the cultivation of this wood, although, as a matter of profit, the locust areas of Monmouth county can show larger returns per acre than the average net receipts from the farmed lands of the State; but it is sufficient for this and for our supply of wood to give to it the thousands of acres not capable of profitable tillage, and the sides of our roads and other grounds now either bare or exclusively devoted to other ornamental trees.

FOREST FIRES.

Fires in woods are common wherever there are large tracts in timber exposed to the dangers from charcoal burning, sedge and brush firing, sparks from locomotives, incendiarism and other accidental circumstances, and all parts of the State have experienced losses from them; but the greatest suffering and heaviest losses are felt in the extreme northwest, on the Kittatinny or Blue Mountain, and in the extensive pine forests of South Jersey. The latter are especially subject to them on account of the dry, sandy soil and the combustible nature of the fallen leaves, twigs, bark, &c.—the undergrowth in these pine woods. During the past few years the losses from fires have been very much greater than formerly in consequence of their frequency and extent. Dr. Theo. T. Price, of Tuckerton, says that the country bounded by the Metedeconk Creek on the north, Denin's Creek on the south, the marl line on the west and the coast line on the east, comprising not less than one million acres of woodland, has been stripped of its wood by charcoal burning and the repeated fires that have swept over it, leaving

much of it "black and charred, under bare poles," almost valueless, either for the cultivation of the soil or for producing timber. Cape May has also suffered quite as much from these frequent fires. These, during the past few years, have also increased in the extent of damage, a single fire burning over thousands of acres. Dr. Price mentions one occurring in 1866, which swept over about ten thousand acres, the burnt district extending from Tuckerton and West Creek, a distance of seven miles westward. The loss was not less than fifty thousand dollars. In 1870 and 1871, nearly the whole wooded portion of Bass River township, Burlington county, was burned over. In 1871 there were two fires in Ocean county, one of which, breaking out at a coaling, ran ten or twelve miles through the pine woods parallel to the coast, in Stafford and Union townships and Little Egg Harbor, in Burlington county; and the other, starting near Lacey, burned over about thirty thousand acres, between the New Jersey Southern Railroad and the seashore. The year 1872, owing to the long drouth in Summer and Autumn, was also noted for the frequency and extent of fires in Southern New Jersey. Dr. Wales, of Tuckahoe, reports one which occurred in August of that year, and which burned over from fifteen to twenty square miles, worth, as he states, before the fire, from ten to thirty dollars per acre, but reduced by it to from two to four dollars. The frequent losses from fire have seriously affected the value of timber lands that so far have escaped its ravages, and Dr. Wales says that the reduction in *saleability*, owing to the great risks to which such property is exposed, amounts to two to three hundred per cent. Formerly the origin of these fires was mostly accidental—from coalings or brush burning, &c.; but latterly the sparks from locomotives running over the new railroad lines traversing this country started the greater number. Instances are known where a single locomotive has set three fires going in a mile's run, and the most extensive fires have been traced to this source. There is also a growing belief that some have been the result of incendiaries—of wood choppers and charcoal burners starting fires for the purpose of making a business for themselves, in coaling the wood which otherwise would have been allowed to remain for the more valuable lumber of an older growth. In many cases it is not actual incendiarism, but carelessness, perhaps intentional, that in this way gives additional work to these people.

In consequence of these fires so frequently devastating this part of the State, there is very little large timber, although more than nine-tenths of the whole surface is in wood, and the residents are obliged to import nearly all the lumber required for their use. Ship-building has been almost entirely abandoned, and the products of the forests may be said to be cordwood and charcoal, instead of the more valuable lumber from wood of older forests. They rob the soil, also, by consuming the leaf mould, which should enrich it, so that

the soils are almost entirely destitute of vegetable matters. So that these fires are, as it were, successive croppings, without adding anything to the soil. In Ocean county it is estimated that the whole area of woodland is burned over every fifteen or twenty years; or that risks are so great as to expect losses at about such intervals of time; and woodland, in some tracts, is valued at two to five dollars an acre. Dr. Price says that "pine lands, once considered valuable for the growth of timber, are much less sought after, and have become to be regarded about as insecure as any property a man can own." He also thinks that the climate has been injuriously affected, and that droughts are much more common than formerly, owing to the dry and parched nature of the whole country, thus stripped of its vegetable covering, and left as "a blackened desert."

Some legislation seems necessary to aid landowners, and all interested in the forests and general welfare and material wealth of the State, to prevent, if possible, these loses by fire, or at least devise some measures to protect property against the dangers from incendiaries, carelessness of coal-burners and others, and locomotive sparks. If nothing more, there might be some restrictions and rules to prevent the wide-spread destruction of property, in case fires get started, whatever the cause may be. The need of legislation in regard to this subject is clearly and forcibly set forth in an appended article by Charles E. Elmer, Esq., of Bridgeton.

FOREST FIRES, AND THE MEANS FOR DIMINISHING OR PREVENTING THEM.

BY CHARLES E. ELMER, ESQ., BRIDGETON.

I have been requested to prepare a paper on forest fires, and to suggest a preventative.

The first part of the request is easily disposed of in general terms —the latter part is far beyond me.

The year of 1872 is noted, the country over, for the extent and destruction of timber land by fires. True it is, that the extent of burning was greatly owing to the remarkably continued dry weather from early spring until early fall.

I have endeavored to ascertain, measurably, the great loss by these frequent and destructive fires, but without success. To assert that 100,000 acres have been burnt over, within the State of New Jersey, at a money loss, in timber, of $1,000,000, would surely be within the bounds of truth. These fires have been occasioned by the careless use (I say careless, when no consideration was given to the great drought and the remarkably dry condition of the soil and of all things lying thereon) of what is called "firing," to burn sedge upon old fields, and "brush" upon new "clearings." From these causes

much waste of valuable timber has been made—the escape fire extending for many miles, when, under ordinary circumstances, it would have been limited, in its "getting away," to a few rods.

Then, again, the damage occasioned by sparks from locomotives has been almost beyond computation as to the extent of acres and loss of timber, which, under the average moisture in the atmosphere and soil underneath, could hardly have occurred at all.

These relations are facts known of all men, and likely to occur again, under like combination of circumstances.

Now, as to a remedy to be had by force of law.

It has been and is held as law in England that fire, communicated by a passing engine, is prima facie proof of negligence in its use, and the onus is placed on the company to show that there was no negligence; that the engine was in proper order, properly run; had all known appliances to prevent fire escaping, and that the track of the road was alike guarded. And this upon the ground that, fire being a dangerous element, the legal responsibility is placed upon those using it to the damage of others, to show that all and every proper precaution and care was had in its use.

Upon this same principle, if a man uses a dangerous article upon his own lands, he is bound, at his peril, to keep it there, and can't be excused for its escape, unless it be by the act of God, or some overpowering force.

In this country this strict ruling has been greatly relaxed, although it may be true yet that, in some of the States, railroads, as also persons (for the same rule must hold good as to both), are held to the strict English rule.

In some other States, as in our own, I think it determined that the railroads are not responsible for a communicated fire, while doing the lawful act of running their engines, unless guilty of "negligence or folly," and the burthen of proof is on the plaintiff to show the *negligence.*

Directing that, with due diligence and proper care, a railroad is not otherwise liable for communicating fire than an individual is for firing his neighbor's property by an accidental spark from his chimney.

What constitutes this "negligence and folly" is for the determination of a jury, each case depending upon the facts educed in evidence, and often times upon the favorable or unfavorable standing of the railroad in the community in which the trial is had.

Another vexatious question, troublesome alike to the courts and railroads is, how far the liability extends, even in case of negligence; whether only to the person immediately damaged, or to those damaged beyond, so far as the fire shall extend? They say the damage beyond the immediate firing is too remote to hold them to account. Upon this our own courts have not formally passed, as in the late

case from Cape May they avoided this question, and determined the case upon other grounds.

How can there be a preventative had against such losses as have occurred from fire in 1872, under like circumstances of great and continued drought, by the rulings of the courts, or by statutory provisions?

The great railroad highways for passage and freight, extending all over the United States, have revolutionized society and business, making rich the people thereof, and increasing in value each acre of land through or near which the iron highway runs.

If by law you require them to run their engines with smoke-stacks so constructed that no spark shall escape then you diminish the speed unreasonably asked for by all travelers, at great risk of life, and you in a great measure destroy the motive power by removing the necessary draft.

If by law you hold them to the strict English rule, that any firing is prima facie evidence of negligence, and put the onus of proof on them, and, in addition, hold them to answer for all damages, however remote from the origin of the fire, and abolish the rule of law that where the injury is the result of concurrent negligence in both plaintiff and defendant no suit can be maintained as might be held to be the case where the owner allows the dry brush and leaves to accumulate in the woods beside the railroad track, might it not work ruin to those companies which are doing so much to build up and enrich the country?

I grant that many of those corporations are becoming too powerful and perhaps dangerous in the use of their strength, and need much, very much restraint; but we are now considering additional legislation to guard against losses by fire occasioned by them in the practice of their lawful business, and I confess that I cannot suggest any other than those hinted at above, and must admit that the propriety of them may be questionable, and may not be effective to that end.

WHEAT RAISING.

BY DAVID PETIT, OF SALEM.

The most successful method of raising wheat I have found, is as follows:—

I would prefer a dry sandy loam; one in which neither sand nor clay predominates to much extent, so as to be easy of tillage.

If the ground intended for wheat has been in oats plow early but not deep, and pulverize thoroughly. If the waste oats have germinated and grown to much size, pasture them off, for they make good pasture and are of no use to the growth of wheat, but rather detrimental.

If there comes no heavy rain in the meantime after plowing and pulverizing to pack the ground, put on the roller when the ground is dry and roll well. There is no danger of packing the seed bed to make it too solid or firm. If the seeding is to be after potatoes, truck or corn, treat the land in the same manner. Then put on the manure. Five loads to the acre of 40 bushels each of good strong composted manure; or ten loads compost made from common barn yard manure, well rotted; or their equivalent in other fertilizers—will make a good crop in an ordinary season—will produce 25 to 30 bushels to the acre, and when the seasons suit, sometimes much more.

Plow under the manure shallow, two or not exceeding three inches, just deep enough to make mellow earth to cover the seed with the drill, leaving the bed below *firm* for the roots to get a good hold in. This firmness of the seed bed enables the plants to start much better than they do by leaving the ground well mellowed below them; and as the size of the crop depends much on the start it gets in the fall, this method I find adds much to it in this way.

When patent manures are used, 200 pounds to the acre drilled in with the wheat answers a better purpose than 400 pounds sown broadcast. This shows the advantage of a concentration of fertilizers to the roots of the crops.

Some of our farmers have found that composted manure applied on the surface of the ground after seeding answers well, and where they have been unable to apply it before seeding, in good season, they have applied it on the surface after seeding with good results. And these results come from the fact, no doubt, that the *nearer* all our fertilizers are placed and kept to the surface of the ground where the *main body* of the roots of our crops do *naturally grow* the better the results are.

Green clover plowed under and rolled well answers a very good substitute for manure. A crop of green clover that would make 1½ tons dry hay, turned under in its green state, rolled and drilled with wheat will make a good crop—straw about as large as it can stand in an ordinary season.

Early sown wheat is generally affected by the fly in the fall, sometimes severely. On strong land well manured it fares much better. Late sown wheat gets but a poor start in the fall. If the land is made strong a rank growth of straw is produced in the spring, which generally rusts before ripe, the grain becomes shrivelled and of a poor quality; or, it is affected by the fly in the spring, which causes the straw to crinkle down and much is lost or damaged thereby. Therefore all things considered I prefer seeding with wheat about the tenth of the tenth month (October), or from the fifth to the tenth. This enables it to escape the fly by seeding after their eggs are deposited, (for this is rarely done after the fifth of the month), and yet gives the young wheat time for a good start before cold weather commences, and thus in a measure secures a crop.

It is a question with me, whether by seeding with wheat early; before the eggs of the fly are deposited we do not induce an increase of that pest; cause it to multiply by supplying it with plants for food, the most congenial to its nature.

Some seasons when the ground has been in good order and weather fair for seeding, wheat has done better when drilled in earlier than the fifth. In such seasons the fly has not been very troublesome, and the better the land is made the less the crop is affected by the fly.

If we could have heat and moisture just sufficient for our purpose, there would be no difficulty in raising 40 or 50 bushels of wheat to the acre on our best land, or as much as is produced in England. But as we cannot have these to suit us, we must work in accordance with and to suit our climatic influences.

If we make our land very strong, we induce a corresponding growth; then, if we have a few days of warm humid weather in the spring while the straw is forming, it produces a heavy growth, and the first rain storm prostrates it—it never rises—becomes blighted, and instead of 40 or 50 bushels to the acre, it falls below an average crop of poor wheat. Such is the effect of our climate. All this would be avoided by a climate the reverse of this, as we witnessed the last year.

DAVID PETIT.

Salem, N. J., second month, 20th, 1873.

NOTE FROM DAVID PETIT ON RAISING CORN.

If I were farming now my greatest ambition would be to raise 200 bushels shelled corn on an acre, for I know it can be done. But the difficulty here is we do not leave our land in grass long enough to form a good stiff sod of green grass which is so good for corn, and so essential in dry weather.

If I were to undertake to raise the 200 bushels on an acre, I should want a good, very stiff green grass sod, and this made rich and plowed not over three inches deep, and I would not care a fig about a soil much deeper, if we can have a subsoil *through* which the moisture can come to the surface, all the better. A good stiff sod, or vegetable matter is one of the best retainers of moisture we have, and this placed about two inches below the surface for food and to imbibe the gentle rains and dews as they fall upon the earth with all they hold in solution, and also to arrest the moisture as it rises from below and hold it for the use of the plants, as rise it must before it can be evaporated. This I hold will make the soil a better retainer of moisture than if plowed much deeper, thus making the soil much poorer and harder, consequently evaporation will go on more rapidly, for the harder the ground is made the deeper it will dry, provided the moisture can pass through it.

A few years ago our citizens dug two cisterns on friends meeting

house property eight feet deep. The fall rains had wet the surface down three or four feet, all below was dry and dusty. Now the water from this eight feet of earth must have passed through the soil and been evaporated. This to me shows the folly of trying to farm deep to reach the moisture. That the better way is to arrest the moisture as it rises and apply it to the crops, as rise it must in a warm, dry time, by the heat of the sun before evaporation can take place. I hope I have made myself explicit. The subject is an interesting one to me, but I do not wish to become a bore to anybody. So with much respect, I subscribe thy friend,

DAVID PETIT.

Salem, N. J., second month, 18th, 1873.

Mr. Petit has a paper in the Country Gentleman of January 8, 1874, on a garden crop of corn raised in 1873. He says: "I have been raising large crops in my garden for several years on a small piece of ground, and I herewith send you some account of the one grown the last season to show what may be grown to the acre. A. Bilderback, the witness to the one grown last season, was an unbeliever in large crops. Although he had lived on the best of land and been a successful farmer for near forty years, yet he would not believe one hundred and twenty bushels were ever grown on an acre; but I promised him if he would select the poorest hill I had and shell and measure the corn it should turn two hundred bushels to the acre. The amount below is the result; the variety Early Sugar."

Mr. Bilderback, who is Judge of the Court of Common Pleas in that county, reports having selected a hill not on the outside of the piece, which yielded one quart and one half pint of shelled corn. The rows were two by three feet, making seven thousand two hundred and sixty hills, or two hundred and eighty-three bushels shelled corn. Mr. Petit then adds that the hill selected by Judge Bilderback "was about as poor a hill as there was in the lot; some hills shelled much more, and had not the corn all been blown up by the roots by a rain storm just after it had set and was fully in silk there would have been considerably more. This will show what land may be made to produce in a favorable season by making it rich and with good management. The ground was well manured last Spring, dug about four inches deep and planted with early peas. These were pulled when fully ripe, and the ground planted with early corn, without digging or manuring again. The corn was hoed once and slightly hilled, soon as large enough to stiffen it, and then left to take its chance. The above is the result. If this result can be fairly attained on a small piece of ground, I hold the opinion that under the same circumstances it can be on a larger and still larger piece. The season was all that could have been asked except the rain storm above alluded to."

A note from Mr. Petit in regard to his soil and its depth says: "The best land, where my son Woodnutt now resides, and it averages as good crops as any in the county, had a soil, when I purchased it in 1845, of about four inches. For the last twenty years the corn has been large, near one hundred bushels; wheat over thirty bushels; clover hay four loads to the acre; and although the subsoil is about as porous as the soil, enough of the roots of the crops have not run into the subsoil to change its color. This is satisfactory evidence to me that they do not naturally seek food and moisture below the soil if they can find them near the surface, where the earth is much warmer."

ON CLEARING AND FARMING THE DRIFT SOILS OF SOUTHERN NEW JERSEY.

BY R. G. BRANDRIFF, MILLVILLE.

Our mode of clearing new land is as follows: I cut the timber off the land as near the 20th of June as we can, which costs $1.25 a cord, and leave the brush lying all over the ground, except a strip about twelve feet wide, all around the edge, where it joins other timber. Said strip we throw the brush in, and rake the leaves into the brush, then plough five or six furrows near the timber; then put the fire in the first dry time, when the wind is favorable, about the 1st of September, and let the fire sweep all over it, which takes about forty minutes to go over forty acres. The fire sweeps it off as clean as a broom, except a few of the butts of the largest limbs, which we gather in piles and burn. Now the land is cleared at a cost not exceeding a dollar an acre, except the cutting the wood, which brings $4 25 a cord in Millville. Then, any time between the burn and next spring, we go over it with the *cutter*, which is simply an A harrow-frame, two feet wide and five feet long, with five cutters six inches long by two wide, and a half-inch thick on the back, raked back at an angle of forty-five degrees, the shape of a sharp-pointed knife blade, placed so as to cut every six inches. We nail a board across the top, put two horses to it, and the driver gets on and rides, and goes over about three acres a day. We next put one horse to a Moore plough, manufactured in New York, and plow it across the cutting, about one inch deep, averaging above an acre a day for each plow, and plant with water-melons and potatoes. We use forty bushels of slaked oyster-shell lime per acre on all land, which costs eleven cents a bushel, and six two-horse loads of barn-yard manure per acre on the melons, and four hundred pounds of phosphate, which costs $50 a ton, on the potatoes, the returns averaging about fifty bushels per acre. Then we follow with wheat plowed in with one horse, about two inches deep, and top-dress with ashes harrowed in, when we can get them, and average from ten to twelve bushels per

acre, and the following spring seed down to clover, and mow or pasture two years, averaging about one ton per acre each cutting. Then break up the two-year old sod with two horses, three or four inches deep, plant with corn, and average about forty bushels per acre; the corn needing no other fertilizer than the sod. The stumps mostly plowed out at this time. Then follow with melons, potatoes, etc. After the first five years' course the wheat should be top-dressed in the fall with about ten loads of composted barn-yard manure, with the lime left off, as we think one coat is all that is needed. As we break up our sod for corn, each time, we plow one inch deeper than it had been plowed before. By following the above course our land has improved each rotation, till it has got up to twenty bushels of wheat, seventy-five of corn, three tons of hay per acre, and other things in proportion. The vegetable mould is about one inch deep, covering a fine sandy loam, suitable to convert into a rich soil, as deep as you have a mind to go.

Marl acts well on this land, but there are other ways we can improve our land cheaper than by buying marl at the price it costs. Plaster is uncertain as a top-dressing. The guanos act well as stimulants, but don't seem to improve our land. Phosphate, used on potatoes or wheat, answers us a good purpose. Clover is our main dependence for increasing the fertility of our soil. If I were deprived the privilege of raising clover, and could get no substitute, I think I should give up farming, etc.

R. G. BRANDRIFF.

Letter to Dr. I. T. Trimble, Nov. 17, 1871.

I think the best plan to give you my ideas of farming here, will be to give you the plan laid down for my future course: which is subject to alterations as I see necessary. My farm fronts on the main road leading from Millville to Cedarville and runs back about 300 rods to the Buckshutem stream which runs within about 25 degrees of being parallel with the road in front, and is bounded on said stream about 275 rods. The swamp is about 40 rods wide, and the muck gets gradually deeper from the shore to the stream, where it is about five feet deep. I have a strip cleared from the road in front to the swamp, and wide enough to make 150 acres. The 50 acres next the swamp I have intended for permanent pasture. The 100 acre plot in front is divided by a lane running from the buildings in front back to the pasture so as to leave two 20 acre fields on one side, and three of the same size on the other side. Now the rotation is corn on the sod, potatoes after corn, wheat after potatoes, clover to mow after wheat and to pasture with hogs and calves the second year, and I keep the rest of my stock on the permanent pasture. I find with the above rotation we can winter more than double the stock that we can summer over, therefore it is necessary to either have about one-third of our land in permanent pasture or soil our

stock. The plan for corn is as follows: Plow as early in the spring as possible from four to six inches deep, and cross plow the same depth just before we plant, turning the sod back on top; harrow down, mark out, and plant the first of May; in cultivation use the scratch harrow first, and then the cultivator altogether afterwards. For potatoes plow as early in the spring as possible; after plowing our corn ground the same depth we did our sod, and then cross plow the last of May, dropping the potatoes, about twenty inches apart in every third furrow, applying 400 pounds Moro-Phillips phosphate per acre either in the same furrow with the seed or broad cast after planting and harrow in across the plowing; also harrow the land over just as they are breaking through, and use the cultivator and hoe altogether in the cultivation. We commence digging in September and rake the veins up and cart in barn-yard or pig-pen, and commence about the 20th of September, and sow 1¼ bushels wheat per acre; plow in about two inches deep, and top dress with fine rotted compost and harrow in; the quantity to be governed by what we can make. The mode of making is to cart out our manure as fast as it accumulates in the stables or yards, and compost it with an equal quantity of muck from the swamp. We also top dress with ashes when convenient. Our sales to be limited to wheat, potatoes, and stock and its products. To sow six quarts of clover seed per acre on the wheat in February; and the first year in clover to mow the first crop for hay, and the second for seed. What I have written is what my experience has taught me.

My whole attention the past four years has been given to clearing and breaking new land, and I have had but little chance of experimenting in any other way. While in South Vineland I tried several plans of raising late cabbage, and the plan that was most successful was to plow under a clover sod six or eight inches deep early in the spring and let it lie undisturbed until about the first of July, and then cross plow the same depth and turn the sod back on top (which would be well rotted), apply a little phosphate, harrow down and set out. This plan I followed the last five or six years that I raised cabbage with remarkable success, averaging about $160 per acre. The last year in Vineland I tried the same plan with corn; plowed six inches deep in February and then cross plowing it back the first of May. The result was 90 bushels of shelled corn per acre, and the balance of the field which was plowed but once, the first of May, yielded 60 bushels. The conclusions drawn from the above and other experiments are that the growing crop needs the best part of the soil near the surface, and at the same time needs deep tillage. Now the question arises which is right, the above plan or shallow plowing and deep subsoiling.

R. G. BRANDRIFF.

Letter to G. H. Cook, December 23, 1871.

NOTE.—Mr. Brandriff, the writer of the above, is a farmer of great experience and remarkable success.—G. H. C.

FARMING ON THE MAGNESIAN LIMESTONE SOILS.

BY CHARLES SCRANTON, OF OXFORD.

You ask me "to give you a report of the method of farming the limestone soils of Warren county, the crops and their order of succession, the tillage, and enriching of the soil." It would give me great pleasure to do this, or any other work that may assist to bring more vividly to the minds of our land-owners in New Jersey the importance to them of their raising increased crops from any given number of acres, and at the same time having their soil constantly growing richer. In giving to you some facts which have come under my own observation during the last thirty-four years in this county and adjacent counties, in regard to the yield of wheat, Indian corn, and other kinds of grain and products of the farm, with the general improved condition of the soil, I have to remark that this county, as you are aware, embraces a large portion of the limestone formation of New Jersey, and lime being easy of access to our farmers, has been for a number of years past largely used as a fertilizer, each year being more esteemed on account of its cheapness and lasting qualities in bettering the condition of the soil. When farmers do not burn their own lime at their leisure during the Winter months, they can purchase it at the kiln for from ten to twelve cents per bushel. It is usually carted onto the fallow fields in heaps of from one to two hundred bushels, and slaked by the action of the air or rain, and then spread in its pulverized state, in quantities varying from forty to one hundred bushels per acre. Some of our farmers use over a hundred bushels per acre on heavy clay soils. This becomes by two plowings pretty thoroughly mixed with the soil, but is of course improved by every successive plowing and harrowing for several years thereafter. The wheat is sown on such prepared soil from September 1st to the 15th, and in the latter part of March or beginning of April following. So our farmers sow about four quarts of red clover seed per acre, which on land that has been limed almost invariably takes well. After harvest the young clover affords a very fair pasture for the months of September, October and November, and the next Summer it is usually mowed for clover hay, and again for clover seed. The following year the clover sward is planted in corn; the corn ground again sown in wheat. This routine has been in constant succession on some of our lands for over fifty years, and the land thus limed and farmed is now capable of producing far better crops of either kind than were grown twenty years ago. I ought perhaps to remark right here that in some cases where the land has not been brought up to the best state of tillage, that one or two crops of clover are sometimes left untouched by the scythe or cattle, in order

to plow under a heavy crop of clover to bring the land up to the standard desired for heavy crops of corn and wheat in their turn. And I might also say that experience has proved that lime is used equally advantageous on strictly limestone formations. I have known farms in this county to produce good crops almost invariably for over twenty years after having had a dressing of one hundred bushels of lime per acre; although I do not think this the best plan for the farmer, for without any doubt it will pay well to put on a dressing of from forty to fifty bushels per acre on almost any farm in Warren county, as often as once every eight or ten years. as by this plan the lands will not be in a simply stand-still condition, but may be made richer and richer each year, as more hay, straw, stalks, &c., is produced by the action of this agent in giving more material for barnyard manures. The time is probably not far off when the use of lime in our county will be doubled. No one having used it thoroughly once can afford to dispense with its use.

In area our county ranks among the small counties of New Jersey; yet the 1870 census reports show a yield of wheat of over two hundred and ninety-five thousand bushels; of Indian corn, near seven hundred and fifty thousand bushels, and a marked increase in the crops of oats, rye, buckwheat and hay, as well as the products of the dairy and live stock. As you are aware, considerable portions of our county are still covered with forests, and some of its very best land as yet uncultivated, for want of proper drainage. Some has not yet been limed at all, and much of it not half enough. I look forward to the time when our products of farms will show a very marked increase. We ought to nearly double our present yields in the next twenty years, by bringing into use unemployed lands, and by improving those now farmed.

The free use of lime has given us our clover crops, and its plant-food has given, in its turn, the increased yields of Indian corn and wheat, and the beautiful condition of our farms, as compared with thirty to forty years ago, and has brought wealth to their owners in two ways: first, by obtaining better crops, and, second, by increased value of the farm. For, during the term of years alluded to, there has been a rapid increase in the value of lands for purely farming purposes, and this has been due principally to the following causes: First, from the knowledge existing of the power to enrich and improve the quality of the soil, while obtaining an increased product by the use of lime as a fertilizer. Second, from our access to the great markets of the country, being made so convenient by our railroad system; and, third, by our rapidly increasing population, mineral developments and manufacturing interests, making for our farmers also a home market.

A farm owned by a near neighbor of mine raised, twenty years since, as a crop, from one hundred and fifty to two hundred bushels of wheat per year. In 1871 the same farm raised about eleven

hundred bushels of wheat and nearly two thousand bushels of Indian corn. The farm was worth, then, about $40 per acre; now it is worth $100 per acre. Another farm was run down and sold, in 1838, for $17 per acre, and now is worth $125 per acre. The use of lime brought both these farms up to a high state of fertility, making both soils and owners rich. There are many similar instances, but these will suffice as an illustration of the facts you desire.

Any district of country has been and will always be valuable, in an agricultural point of view, according to its capacity to support human and animal life, coupled with its ability to keep its soil in a continued improving state, from its own resources and fertilizers. By a reference to the United States Census of 1810 and 1820, when our county formed a part of Sussex county, you will observe that this (then Sussex) was the most populous county in New Jersey. At that period there were no towns or villages within its borders having a population exceeding three hundred. The population of 1820, with the exception of, say, about six hundred souls engaged in the production of iron, was purely agricultural.

The greater portion of lime used in the county has been used within the past twenty-five years. Many of our farmers have as yet used very little. It is only within the past few years that they have come to realize its vast benefit to them in ridding their soils of sorrels and other noxious weeds, and in giving to the animals raised a greater size of bone and frame and food to add flesh to cover it. I observe from the census reports, as I have with my eyes, that the naturally rich soil of Sussex county, having a much larger area than this county, does not keep pace with this county in grain raising. This county probably uses, from time to time, as much lime as Sussex county—each county has nearly equal facilities for obtaining lime cheaply—while Hunterdon and Somerset counties, having only a small limestone formation, yet by a large use of lime both of these counties are increasing in their yields of wheat and Indian corn, to say nothing of the vastly enhanced value to their lands. I assume it to be a fact beyond contradiction that the three counties of Warren, Hunterdon and Somerset, which have been farmed for over a hundred years on these grains, have to-day a capacity to raise more grain than at any previous period. Each county can increase their product largely by a judicious increased use of lime. Now, then, assuming that fifty bushels of lime per acre will serve the purpose pretty well on most farms, and that it will cost in Middlesex, or any of our middle counties, not exceeding twenty-five cents per bushel on the cars, you have a cost for dressing an acre of twelve dollars and fifty cents, and if its good effects are to be seen, as have been seen in this county, say for only ten years from the one application, you have a cost of say one dollar and twenty-five cents per acre per year. Without any doubt lime is the cheapest fertilizer known, where it can be purchased so as not to cost over twenty-five

cents per bushel put on the land, and as New Jersey has lime enough to fertilize a continent, and as it is as cheap or cheaper than in almost any part of the Union, I hope to see the day when it will be more generally used, at least in our own State, and when we shall have an annual yield of four million bushels of wheat and over ten million bushels of corn. As our soil is enriched to increase these two staples the other good things of the earth will come along in their seasons all the better. I believe I have touched upon all the points you asked me to, though very imperfectly. Believe me

Very truly yours,

CHAS. SCRANTON.

Letter to G. H. Cook, January 27, 1873.

REPORT ON PLEURO-PNEUMONIA.

To the State Board of Agriculture of New Jersey:

Your committee appointed to investigate and report on the introduction of pleuro-pneumonia into this State, and what measures are necessary to effectually stamp it out, respectfully report that they find from reliable data that the disease was first introduced into this country about the year 1850, when a cow was brought over from England as a ship's cow, and sold to a German near South Ferry, Brooklyn. This cow was transferred to one of the herds in Skillman street, where the disease was never heard of before. It died there with this disease, imparting the same to the whole herd. The disease spread through the herds of Brooklyn, Long Island, Westchester county, and some herds in New Jersey.

Mr. John Edgar, of Woodbridge, New Jersey, purchased a cow which communicated the disease to a valuable herd of cattle of which he lost a large part, but by careful management he prevented the disease from spreading to his neighbors.

Mr. Obed Meeker, at Waverly, about the same time lost a large part of his herd. He suspected that beer grains had made his cows sick, but on further inquiry found it to be pleuro-pneumonia introduced by purchasing some cattle in New York, but by care he prevented its spreading. In Brooklyn the disease prevailed for several years and took off annually thirty per cent. of the cattle, and the effects of the disease were such that the keeping of cattle in those places was fast becoming profitless. It appeared on investigation that the theory of the self-producing character of the disease, or that it was generated in badly ventilated stables, was wholly without foundation. Inoculation was tried without perceptible advantage. So far as we have read reports of the practice, the results have been anything but favorable. As the matter is generally inserted into the tail, this very often becomes violently inflamed, mortifies and falls off, which accounts for the erroneous statement that beer grains and swill from the distilleries rotted off the cows tails.

About 1862 the disease prevailed at Waverly, near the fair grounds, and the officers of the State Agricultural Society attempted to enforce the law. But Mr. Johnson, the owner of the stock, was not willing to surrender his herd to be slaughtered without some compensation. One or two of them were purchased by the officers of the State society and post mortem examination was made and developed

unmistakable signs of pleuro-pneumonia. The farmers in the neighborhood became alarmed and took measures to prevent the spread of the disease, which proved successful. In the summer of 1870 the disease broke out in the neighborhood of Mount Holly, from the introduction of a single cow turned into a pasture with a large herd of cattle belonging to eight or ten different farmers. This cow sickened and died without attracting much notice, till others became sick and died. When examined they were found to have pleuro-pneumonia, they remained in the pasture till late in the fall, when the diseased ones were killed and those that appeared to be well were taken home, thus carrying the disease to different farms, causing the loss of about one hundred and fifty head of cattle.

In the year 1871 the disease prevailed in Ocean and Camden counties, causing serious loss.

In 1872 it was introduced into Essex county by cattle bronght from Baltimore to Newark by the car load, and thence sold to the farmers of Essex and Union counties, causing a loss of from fifty to seventy-five per cent. of the herds of the farmers and milkmen of those counties. Many of the cattle left have been hurriedly sold to escape further loss, thus spreading the disease and polluting the markets with unwholesome meat.

Many farmers, as soon as they were aware of the nature of the disease, took some trouble to prevent its spreading, by warning their neighbors not to expose their herds to those that were diseased, refusing to sell any of their own cattle that had been exposed and burying those that died.

In the past two years the disease has prevailed in Essex county, and in the vicinity probably five hundred head of cattle have died, and large numbers of those that had been exposed to the disease have been sold to unprincipled men for the small sum of from five to fifteen dollars apiece. Meantime, little or nothing has been done to enforce the law or stay the progress of the disease. The men that introduced it and spread it among the farmers, have damaged them many thousands of dollars, and the dairy business in this section of the country, is hazardous, whilst those parties are still engaged in buying and selling diseased stock, without any hindrance from the authorities.

Great deception is practiced upon the farmers by the dealers in this stock. One of them went to a farmer in South Orange, Mr. W. Courter, offering to sell some fresh milch cows. Mr. Courter replied that there was so much of the disease prevailing in Newark and the vicinity, that he was afraid to buy; but that if he could get some from Morris county, where there was no disease, he would like to purchase. The dealer stated that he could accommodate him, as he had a drove coming from Somerset county in a few days, and would bring them down by his place, when he would have an opportunity of seeing them. According to agreement, he came, and Mr. Courter

made an exchange for some of his cows. Soon after, these cows were taken, his milkman refused to take his milk, and he was put to great inconvenience, and lost a large part of his whole herd. On inquiry, Mr. Courter learned that those cows were driven out of Newark, through the village of South Orange, and down by his place.

Mr. Dodd, living near the State fair grounds, bought a cow of the same party, and lost ten of his herd, and sold three to a German. After some months, he purchased some fresh milch cows, and had the disease a second time.

In the township of Union, a Mr. Potter purchased a cow of a dealer, and shortly after, said cow sickened and died, and nine of his cattle also died, in a herd of twelve, after trying every known remedy. The disease spread from Mr. Potter's herd to his neighbor's, Mr. Crowell and also to Mrs. Carpenter's farm, each of them losing seven head, making twenty-four in all which died from the effects of this one case.

Mr. Crowell suffered to the amount of one thousand dollars, losing his milk route in Elizabeth and causing him much expense in trying prescriptions. Hearing that there was a man in Philadelphia who had an infallible cure for the malady, Mr. Crowell went there and paid fifty dollars for medicine, and the receipt to make it. For a time the effects of the medicine were encouraging, but afterwards it proved nearly worthless.

In East Orange the disease prevailed in the summer of 1872, among several milk herds to an alarming extent, some of the owners sold all their herds as soon as they were aware of the infectious nature of the disease, and resorted to cleansing their stables by removing their stalls and manure, using disinfectants such as white-washing, and airing for several weeks. One milkman after this process, went out into the country and purchased over one thousand dollars worth of cows and brought them home. They soon became diseased and died or were sold, thus showing that the stables of those dealers are calculated to infect healthy cattle in a very short time. And the cars used for transporting them may carry the disease to distant parts of our land.

The disease is highly contagious; instances are on record where cattle apparently sound, were capable and did give it to other cattle, which had it in its acute form. It is related in the report of the Commissioner of Massachusetts, that a Mr. W. Walker, of Quincy, was at Squantum, when diseased cattle were killed; there he closely examined portions of a diseased lung, and walked through the blood of the slain animals. He then rode home a mile and a half and went to the barn and fed his cattle. These became diseased. Two were sold to Mr. E. B. Taylor, and all but three out of his herd of twenty-one, were found diseased.

One pertinent fact may be stated here, that a single cow imported

into Australia with this disease shut up in her lungs, has imparted the same, by computation, to no less than 100,000 cattle.

These statements will suffice to show the dangerous character of the disease. The past summer it was hoped the disease had subsided, but on inquiry it was found that many of the farmers and milkmen had suffered heavy losses, and that it had extended to other townships, and to many herds which had been before exempt; doubtless, much of the disease was suppressed.

Parties who were willing to converse on the subject with your committee, acknowledged that their near neighbors did not for a long time, know they had the disease among their cattle.

When their cattle died they were buried in the night. Great improprieties were practiced as turning such cattle on the streets, also selling them when badly diseased.

A number of milkmen in Newark are known to have the disease among their cattle the present winter. Upon inquiry by a responsible German sent by your committee, they denied ever having the disease, but admitted they had lost a number of cows by over-feeding them with the grains and Indian meal. One man admitted that he had suffered to the amount of eight hundred dollars. Upon further inquiry of one of the employees of this man, he said the boss purchased three cows of a dealer, and they sickened and died, and he had lost in all twelve; also, two others in the immediate vicinity had suffered severe losses. The past two summers the disease has prevailed at Waverly near the Fair Grounds. A milkman by the name of Michell lost so badly that he abandoned the business. Some large herds of cattle, as soon as the disease appeared among them, were sold as speedily as possible. In the large towns and cities small groceries and cheap boarding houses are abundantly supplied with low priced beef; and honest farmers and milkmen are tempted to purchase splendid looking cows, to all outward appearance well and sound, represented as being brought from the counties of Somerset and Morris, at a rather low price, and warranted to give from eighteen to twenty quarts per day, and numbers have purchased to their sorrow. And now, a dealer that offers his stock to intelligent men will receive a very short answer: "No; I would not take them as a gift." Consequently they are taken farther on, and very likely put on the cars and sent off some fifty or a hundred miles.

In former years, when the disease was in the hands of honest farmers mainly—honorable men, as John Edgar, of Woodbridge; O. Meeker, of Clinton; James Lippincott, of Mount Holly, and others in that vicinity, who have suffered from time to time—men who have a regard for what is due to others—in such hands the disease is shorn of much of its danger. But the buying and selling is but a speculation to make money regardless of consequences, and men who were recently considered incapable of mean acts sell whole

herds of diseased cattle, or those that have been exposed to it, to unprincipled men, to be disposed of to the best advantage to their pockets; and when remonstrated with in regard to such acts, and told that there is a law or should be a law against it, reply: "We want no law; let every man take care of himself;" and gentlemen of standing ridicule the efforts of your committee and others who are laboring to get a law to punish those who commit such criminal acts, and to stay the progress of the disease and prevent its spreading all over our State. For the want of a law similar to that of Massachusetts your committee have ample cause to believe that the farmers and milkmen in the three counties of Hudson, Essex and Union, the past three years, have suffered to the amount of one hundred thousand dollars, at the lowest estimate; and those unprincipled men who brought the cattle from Maryland and sold them to the farmers have made money and go unpunished.

Your committee feel it their duty to state some facts of its ravages in other countries.

This formidable disease of neat cattle has of late years prevailed simultaneously over large tracts of Europe, and other parts of the Old World, exhibiting everywhere the same leading characteristics. It would therefore appear to result from the operation of some general cause.

By its wide spread ravages in many parts of Europe it has ruined many diarymen, breeders and stockholders, and exerted a great influence upon the beef market. From Collot, the author of a recent and valuable French work on the dairy cow, who speaks of this disease. This malady is the greatest scourge which can fall upon the farmer; it is hereditary, or rather never disappears from a country which it has once invaded. To my mind the terrible typhus or rinderpest is less to be dreaded than pleuro-pneumonia, because if it strikes severely it may disappear, and is not persistent; the will is only temporary, while with pleuro-puenomia it is lasting, contagious, and epidemic or latent, and ready to break out on any exciting cause. It is then the most terrible of maladies which could threaten our most valuable herds of cattle, and I cannot comprehend the apathy of the government with regard to so great a calamity, which is insensibly extending in France and endangering the most powerful lever of our agriculture, neat cattle. The German countries give us an example of energetic measures, why should we hesitate to follow them?

When the invasion is well ascertained the public functionaries should advise the destruction of all the cattle in the barn, where the disease has established itself. If the owner refuses to take this advice good, as well for him as for the public at large, the public officer ought to do all in his power to hem in the disease and to prevent the animals from being brought in contact with others in the pastures, or to be driven to the markets and the fairs. In fine, it will

be necessary to establish around the locality of the infection a kind of quarantine, to notify the prefect and the minister of agriculture, and to raise a loud cry of alarm, because no malady has ever done so much evil as pleuro-pneumonia.

It has been estimated that during the eighteenth century the rinderpest destroyed in Europe, as many as two hunnred millions of cattle. From the foregoing statements of Collot, it is probable that pleuro-pneumonia has been equally destructive.

In the British possessions at the Cape of Good Hope, where great numbers of cattle are kept, pleuro-pneumonia appeared about the year 1854. It is believed to have been started there by means of an importation from Holland. A bull having been brought from that country, in which the seeds of the disease existed. He was taken sick three or four months after his shipment from Europe, and as there is very unrestrained communication among the cattle of South Africa, the infection naturally spread with great rapidity.

It appears from statistical returns that the number of cattle that died of the disease in the colony during the year 1855, was little short of one hundred thousand, and it has been very prevalent since then, although probably of late years, with diminished virulence.

Suppose a single animal that had been exposed to the disease was transferred to Texas, and permitted to roam with the herds upon the plains, is it not probable that it would produce like results, as it did at the Cape of Good Hope? Would it not be a national calamity?

One of the most eminent of English writers on the subject, in giving an account of his observations in that part of Holland from which pleuro-pneumonia seems to have been brought to Massachusetts, says: by statistical returns from forty three villages in North Holland and Friesland, it is shown that only eight of them have been comparatively free from pleuro-pneumonia, and in these very few cattle are kept. In the villages where the disease has prevailed, about a fifth part only of the cattle owners have escaped, but in many, every proprietor has had his herd affected. In the first quarter of the present year the official returns show a total loss of 3,655 head of cattle, of which 1,502 died, and 2,153 were killed by order of the authorities, which gives an average loss of about 281 per week.

Changes Affected by the Disease, on the Milk and Flesh.—The question is often asked whether it is safe to use as food the milk and meat of animals affected with pleuro pneumonia. To this it may be replied that in Europe whenever an animal showing symptoms of the disease, is in a sufficiently good condition to make beef, it is slaughtered as quickly as possible for this purpose, and no public prevention is opposed. Not long since, the Highland Agricultural Society of Scotland, awarded a gold medal to Mr. Finley Dunn, Jr., of Edinburgh, for a treatise on pleuro-pneumonia, in which he says upon this subject:

"Much difference of opinion exists, concerning the propriety of using the flesh or milk of animals affected with pleuro-pneumonia. In the first stages of the disease, and before the inflammatory disease has run its course, we are of opinion that the meat is perfectly sound and well tasted; but when the malady assumes the typhus form, a change has taken place in the animal solids, the secretions are vitiated, and the meat itself is discolored showing that it cannot now be safely used as an article of human food."

Of course your committee cannot recommend the use of meat or milk from diseased cattle. It happily occurs that when cows become seriously affected, the secretion of milk generally ceases or is very small in quantity.

Symptoms.—The first symptoms of pleuro-pneumonia seldom attract much attention, and the disease commonly steals on without manifesting any great violence; the animal appears dejected, and when in the field separates itself from its fellows, often getting behind a wall, hedge or other shelter to keep out of the wind. As the disease progresses, it becomes uneasy, loses its appetite, and stops chewing the cud, the eyes appear dull, the head is lowered, the nose stuck forward, the nostrils expanded, and the horns and skin are warmer than common. With failure of the appetite for food, thirst may continue. In cows, the milk falls off either gradually or altogether. It is seldom that the first progress of the disease attracts much notice until the animal stops eating. Cough, although frequently accompanying the disease, is by no means a constant symptom. When, however, the pleura or lining membrane of the windpipe or the bronchial tubes become inflamed, loud and harsh cough is a never-failing symptom. Pressure between the ribs and along the spine, causes the animal to wince. The breath grows warmer and often fetid, the danger rapidly increases of course. The animal will often press her muzzle very hard against the partition as if for support and breath with difficulty, and soon dies. The progressive symptom varies greatly, however, in different animals, but the cough is the key-note of the disease, and appears in all.

There seems to be no longer room for doubt that the disease is contagious or infectious. If appears to be communicated by animal poison in the air, proceeding from the lungs and breath or the respiratory surfaces of a diseased animal, and any animal of the same species, coming in contact or within the influence of this vitiated air, is very liable to be ingected.

Treatment.—In regard to the medical treatment of this disease, it is proper to state that we are entirely unskilled in the veterinary art; all that we can properly say upon this important branch of the subject must, therefore, be derived from other sources, and we have endeavored to select from the best of these we could find, especially those emanating from persons who have had the most extensive

opportunities of observing and the longest experience in treating the disease. The ignorant demand specifics, and attach but secondary importance to measures of prevention.

Mr. Dunn, of Edinburgh, in his excellent treatise upon the disease, observes very appropriately: "The practitioner is often asked, not only by uneducated persons, but by persons who ought to know better, whether any specific has been discovered for the cure of pleuro-pneumonia. But can anything be more preposterous than such a question? How or where can we discover a sovereign and never-failing remedy for a disease which exhibits such diversity of form and which attacks such vital organs as the lungs?"

In Massachusetts, where the agricultural interests are based upon its neat stock, the spread among them of a fatal disease, resembling that which for many years past has been devastating the herds of Europe, naturally produces much public excitement and alarm. The Legislature, during its regular session, took the subject into serious consideration, and displayed, in their vigorous action, the tone which has animated most of the European Governments in their efforts to check the plague or lessen its violence.

Viewing the disease as one brought from a foreign country, and propagated by contagion alone, the Legislature at its last session passed, on the 4th of April, an act providing for the appointment of three commissioners, who were required to take measures for the extirpation of the disease. They were authorized and required to visit, without delay, the several places in the commonwealth where the disease was known or supposed to exist, and empowered to cause all cattle which had been diseased, or had belonged to diseased herds, to be forthwith killed and buried, and the premises where they were kept cleansed and purified; to appraise, in their discretion, the value of the cattle killed which were apparently well, and certify to Governor and Council the allowances made to the owners, and give such lawful orders and directions as, in their judgment, the public necessity might require.

The commissioners promptly entered upon their duties, and from the sickness found in various herds and the number of cattle they had occasion to slaughter, the appropriation of one hundred thousand dollars, placed at their disposal by the Legislature, was soon exhausted, with a like amount furnished by contributions from the State Agricultural Society and liberal public-spirited individuals. But it was soon found that the disease had spread itself over a larger extent of territory than it was first supposed to occupy. More appropriations were required, and the Governor summoned an extra session of the Legislature. The Governor, in his message to the extra session, viewed the disease as one purely contagious—not a disaster affecting Massachusetts or New England alone, but a contagion which, if allowed to spread without effort to extirpate or restrain it, must ultimately ravage the whole country. Upon the

basis furnished by the census of 1850, he estimates the present property in cattle throughout the Union at no less than six hundred and forty millions of dollars, and at the present time a billion—an interest second only in importance to that of Indian corn. But these figures, he observes, very imperfectly represent the interest of the American people in this gigantic industrial product. How far it enters into the employment of the great majority of persons; how many millions are dependent upon it for the luxuries and necessities of life; to what extent it contributes indirectly to public health and enjoyment, and how large a part of it forms the sound and reliable business of the country, are considerations which naturally occur to the mind of every intelligent person. If, he continues, we could confine the ravages of the fatal distemper, so unfortunately deposited on our shores, to our own State, it would still be of sufficient importance to demand the earnest attention of the people; but unless extirpated on the instant it appears, it cannot be so confined. If it spread over our own territory it must ravage other States and it becomes a duty of the highest character—one which we owe alike to ourselves, to the honor of Massachusetts, and to the people of the whole country—to make every available and possible effort to restrain its ravages, if extirpation is impossible. Admitting that it may not be in our power to prevent its spreading through the country, nevertheless every citizen of Massachusetts should have it in his power to say that every proper effort has been made by the State to produce that result. I am constrained to express the opinion that all has not yet been done which may be wisely if not successfully performed, and this fact I offer to you as a chief reason for this extraordinary convocation. This would seem to be a measure which the natural comity existing between friendly States would absolutely demand.

The motives which inspired the public authorities of Massachusetts do them much honor, and merit the commendation of sister States in similar trouble, and should incite New Jersey to action also.

JOHN CRANE,
P. T. QUINN,
WM. M. FORCE,
Committee.

February 25, 1874.

The following is a partial list of Agricultural and Horticultural Societies in the State:

THE NEW JERSEY STATE AGRICULTURAL SOCIETY.

ORGANIZED, 1855.

President—Hon. Amos Clark, Jr., Elizabeth.
Recording Secretary—William M. Force, Newark.
Corresponding Secretary—P. T. Quinn, Newark.
Number of Members—340.

Meetings of the Directors are held on the third Wednesday in June, October and January, and the annual meeting of the Society on the third Wednesday in January.

The annual exhibition is held at Waverly, Essex county, in September, and is becoming year by year more attractive to people from all parts of the State, and more useful to agricultural and mechanical interests.

NEW JERSEY CRANBERRY GROWERS' ASSOCIATION.

ORGANIZED APRIL 25, 1873.

President—Rev. J. H. Brakeley, Bordentown.
Vice Presidents—James A. Fenwick, New Lisbon; Dr. E. S. Merriman, Bricksburg.
Secretary—Whitfield S. Johnson, Trenton.
The above, with E. W. Crane, Caldwell, constitute an Executive Committee.

County Secretaries are also appointed for the cranberry-growing counties.
Number of Members, 100.

The annual meeting is held at Trenton on the third Tuesday in January; the annual convention, on the first Tuesday in September, at a place previously designated. The next convention will be held at Bricksburg, on Tuesday, September 1, 1874.

"Although it is now considerably less than a year since the organization of the Association, its influence has already been marked, and beneficial. Three well attended meetings have been held; matters of interest freely discussed; scientific and practical essays prepared and read; an official organ has been adopted—the Weekly Bricksburg Times and Journal—which also publishes a quarterly supplement devoted exclusively to the cranberry interest; a complete system of standard measures has been adopted, and is already in very general use; a Foreign Trade enterprise has been inaugurated, and growers have become acquainted and united for mutual improvement."

The following detailed account of the organization, work and aims of the Association is furnished by E. W. Crane, Esq., of Caldwell, Essex county:

"There had been, previous to our meeting at Pemberton. two organizations, called respectively the New Jersey Cranberry Growers' Association and the Cranberry Union. The objects of both being similar, they were consolidated under the name of the former—'New Jersey Cranberry Growers' Association.'

"We have succeeded beyond our anticipations, and hope we may keep up the interest. The reform in packages was much needed, for cranberry boxes and barrels were very much like *peach baskets and pieces of chalk*, extremely variable in size. The standards adopted are: a barrel, of three bushels; a crate, of one bushel; and also a smaller crate, of one peck; all of them, when properly filled, hold the quantities named, 'rounded measure,' the 'round' consisting of three and a half quarts more per bushel than 'struck' measure.

"The barrel is the same as that adopted as a standard by the Cape Cod Cranberry Growers' Association, which secures uniformity where they come in competition. It is made of twenty-eight and a half inch staves, so jointed as to give a bilge of seven and a half inches, head sixteen and five-eighths inches diameter, and so set in staves as to leave the inside measurement twenty-five and three-eighths inches; and the finished barrels about twenty-eight inches in height.

"The one bushel crates must measure inside, exclusive of middle partition, eight and three-eighths inches by twelve by twenty-two inches, equal to two thousand two hundred and eleven cubic inches.

"The one peck crates must measure inside, six inches by eight and three-eighths inches by eleven inches, equal to five hundred and fifty-two and three-fourths cubic inches.

"The packages are all made by manufacturers, who apply to the Standard Measure Committee for the official brand of the Association; are furnished the necessary directions, and agree to brand or stamp only standard sizes, holding them at all times subject to the inspection of the committee, who are charged with exposing all cases of fraud brought to their notice, both through the press and by circulars sent to parties interested.

"The sizes have been sent to both growers and dealers, so that all may know them, and fraudulent sizes, if any are made, can at once be traced to the maker by the simple arrangement of having the *initials of each manufacturer* on his own brand, and there are *no regular brands* without these *individual initials* cast with the others, as it consists of those of the Association with those of the manufacturer underneath, in smaller letters, and between two arrowheads. They are furnished only by the committee:

N. J. C. G. A. ÷ A. V. ÷	D. T. Staniford, New Egypt; E. W. Crane, Caldwell; Hon. W. S. Johnson, Trenton;

and a record of them is kept and published.

"Above I give you a small representation of the Association brand, with initials of Mr. A. Vanhise, of Cassville, the largest box manufacturer in the State.

I mention the work of the association thus in detail, that, if you think it of sufficient importance, you may notice it at such length as you deem advisable in your report, for publicity with it is what we want. Where known it commends itself to honest growers, dealers or buyers, and by making it known we hope to *compel* its use in self-defence, with those who do not prefer honesty. The success it has thus far met may also stimulate a like movement in regard to peach and other fruit baskets and boxes. We think the *initial check* system is of special value in tracing fraud. We have already furnished the brands to three barrel and ten box manufacturers."

ATLANTIC COUNTY.

FRUIT GROWERS' UNION—ORGANIZED 1868.

President—George F. Saxton, Hammonton.
Secretary—Gerry Valentine, Hammonton.
Other Officers—One Vice President and Six Directors.
Number of Members—100 (about).

This "Union" has taken the place of "The Pomological Society," though the latter was never formally dissolved. It was organized for the special purpose of marketing the fruit of members to better advantage than formerly, and seems to have been measurably successful. For each of the last two years the association has procured and distributed among the members one hundred tons of "fish guano" from the shore, which has been found to give entire satisfaction as a good and cheap fertilizer. The Secretary reports that "there is a general and increasing interest manifested here in general farming, and last year we raised fine crops of corn and potatoes, which has given us much courage in that direction. A larger breadth of strawberries and blackberries is being cultivated now than for two or three years before. Pears are being set, too, in larger quantities than ever before, as last year's pears did remarkably well; and the same was true of apples. The Curculio troubled us less last year than for years before."

EGG HARBOR CITY AGRICULTURAL SOCIETY—ORGANIZED MARCH 23, 1859.

President—Charles Kraus, Egg Harbor City.
Vice President—Philip Steigauf, Egg Harbor City.
Secretary—Valentine P. Hofmann, Egg Harbor City.
Treasurer—Charles Gruner, Egg Harbor City.
Number of Members—30.

Meetings are held on the first and third Fridays of every month, and exhibitions in the latter part of September. One of the chief objects in the formation of the society was to encourage the cultivation of the grape. Experiments were accordingly made with at least forty varieties, which have been gradually reduced to the following: Concord, Norton's Virginia Seedling, Ives Seedling, Clinton, Martha, Venango, Clevener, Roger's Hybrids Nos. 1, 4 and 15, Franklin. Some new varieties as Cynthiana, Taylor's Bullit, are being tested and promise to be worthy of culture. Catawba and Isabella's are displaced from our vineyards on account of their

unequal ripening. Delawares will not thrive in this soil. To the preparation of the soil of vineyards more attention has been given of late years than formerly, so that now hardly a vine is planted in any other but well trenched ground of from two to three feet in depth, while formerly no special attention was paid as to the planting.

The vines are generally trained on the trellis system; the cylindrical mode of training vines is practiced by several vintagers with good success. Vines are planted, according to varieties, from five to six feet, six to six, six to seven, and six to eight apart. Of late years about one-quarter of the grape crop was brought to market, the balance was pressed into wine. At the least calculation forty thousand gallons of wine were pressed last season. Wine is valued from $1.25 to $2.00, and generally finds a ready market.

Our society being under the impression that silk culture would thrive in our climate and soil, made the first attempt two years ago. For this purpose it ordered the eggs and distributed them gratuitously among all applicants; the first attempt, although few were acquainted with the mode of culture, proved encouraging, as did also that of last year. The silk worms were fed with Mulberry and Osage Orange leaves, without showing any marked difference. Some of the reeled and dyed silk will compare favorably with any imported. But few as yet engaging in its culture, the quantity is insufficient to prove remunerative at present.

This society, through its annual fairs, says the secretary, has exerted a powerful influence in the progress of all branches of agricultural and industrial pursuits, and has promoted a material enhancement of valuations in the community. Great attention is given to fruit culture. The pear stands deservedly at the head of the fruits, it proving productive and of remarkable quality. The apple stood aback, in consequence of the severe attacks of apple moths, but as the trees are growing older, they become more productive and less subject to attacks; last year such splendid specimens and such a bountiful harvest was raised that everybody was astonished. The quince thrives well, and finds a ready market. Peaches are cultivated on a small scale. Plums and cherries on a still smaller scale. A system of mixed husbandry is pursued by the surrounding farmers. The chief staples are corn, rye, buckwheat, round and sweet potatoes, and turnips. Clover is the chief forage crop, the grasses suffering too severely from our protracted droughts in summer.

Stock raising is as yet in its infancy, the main object being to keep up the necessary number of stock required for farm purposes.

BURLINGTON COUNTY.

PROGRESSIVE FARMERS' CLUB OF BURLINGTON COUNTY—ORGANIZED DECEMBER, 1865.

President—John E. Darnell, Mount Laurel.
Recording Secretary—Henry C. Herr, Hainesport.
Corresponding Secretary—Mark H. Busby, Masonville.
Librarian—Ezra Darnell.
Number of Members—85 (life).

Meetings are held on the first Monday of every month, at Mount Laurel. Exhibitions are held in September and December; the first for fruits, grains, &c., and the second for poultry.

This club was the first one organized in its section of Burlington county, and owns a building devoted wholly to its own uses.

The meetings were at first held at private houses, but rapidly increasing numbers admonished the members that larger accommodations were necessary. Initiatory steps were taken to erect a suitable hall in which to hold meetings; contributions were solicited, and through the liberality of the members sufficient means were raised to warrant the commencement of the building. Two of the members donated a lot of ground adjoining the village of Mount Laurel, and January, 1867, found the club in possession of a fine hall erected at a cost of about $3,000. The building is of frame, thirty-five feet by forty-six feet, two stories high. The upper story is fitted up for the meetings of the club. The lower one is used for the exhibitions of the club and various other purposes. The entire cost of the building is paid, and the club has a handsome surplus in the treasury, the receipts from all sources being about $400 a year.

The object of the club as stated in the constitution "is to disseminate a knowledge of good farming among its members, to afford a means of distributing seeds, grafts, cuttings, and the like, to collect statistics of agricultural matters, and to discuss all topics affecting the prosperity of its members as farmers, viz.: markets, crops, agricultural laws, &c."

The members are either life or annual members. A payment of $10 constitutes one a life member, for which a certificate of membership, entitling the holder to one share of stock, is issued. A payment of $3 and $1 annually thereafter constitutes a person an annual member.

The club also acts somewhat in the capacity of a co-operative society, purchasing coal, guano, &c., by the quantity, at wholesale prices, thereby enabling the members to procure these articles at much lower prices than they otherwise could.

A farm committee consisting of sixteen members is appointed at the annual meeting, held the first Monday in January, whose duty it is to visit the farm of each member, and to make an impartial report on the condition of farm buildings, crops, tillage, yearly improvement, if any, and to collect such statistics as may be interesting to the club. The report of this committee is generally quite voluminous and is read at the annual meeting, when most of the members are present.

The results arising from the visits of this committee are most beneficial as is seen in the improved appearance of the buildings and their surroundings, in neat and well trimmed fences, and in clean and careful tillage.

This club, in connection with other clubs from Burlington, Camden and Gloucester counties, has organized a "Farmers' General Conference Club," which meets quarterly, the object of which is "to collect and disseminate agricultural information, to act on matters of general interest, and for the mutual protection of agriculturists." The Conference Club has an attorney in Philadelphia employed by the year to protect the interest of members selling produce in that city.

In order to give an idea of the resources of the section of Burlington county in which the club is located, the following statistics, collected by the farm committee for the year 1871, may be of interest. These statistics being gathered from the members of the club only:

Number of acres of	improved land,	9,891
" "	unimproved land,	1,315
" "	corn,	1,511
" "	wheat,	880
" "	rye,	728
" "	oats,	93
" "	potatoes,	449
" "	truck,	181
"	tons of hay,	3,723
"	horses and mules,	412
"	cattle,	1,782
"	sheep,	1,091
"	hogs,	1,096

BURLINGTON COUNTY AGRICULTURAL SOCIETY—ORGANIZED 1846.

President—William R. Lippincott, Cinnaminson.

Vice Presidents—Andrew H. Fort, Edmund Darnell, Abraham P Stackhouse, William R. Hancock.

Recording Secretary—Charles Darnell, Mount Holly.

Corresponding Secretary—George C. Brown, Mount Holly.

Treasurer—Edward B. Jones, Mount Holly.

Number of Members—400.

Meetings are held quarterly, viz.: on the fourth Saturday in January, April and July, and the Saturday after the annual exhibition, which is held the last Tuesday and Wednesday in September.

BURLINGTON COUNTY FARMERS' CLUB—ORGANIZED 1871.

President—James Lippincott, Mount Holly.
Vice Presidents—Clayton Zelley, Joseph W. Emley, James Logan.
Secretary—Henry J. Budd.
Treasurer—Edward L. Bowne.
Number of Members—60.

Meetings are held on the third Saturday in each month. No exhibitions are held.

CAMDEN COUNTY.

FARMERS MUTUAL BENEFIT ASSOCIATION—ORGANIZED JANUARY, 1872.

President—Joseph C. Hollingshead, Haddonfield.
Vice President—George D. Stewart, Haddonfield.
Secretary—Edward Burrough, Merchantville.
Number of Members—35.

Meetings are held regularly on the last Thursday in each month at two o'clock P. M. in winter, and four P. M. in summer. At these meetings, besides the ordinary business, various important questions are carefully discussed, of which the following are samples, viz.:—Wintering stock. Best time to plough for corn. Best time of planting and manuring corn. Time of cutting and curing hay. Best manner of applying lime. Proper time of sowing wheat. Best time of sowing clover and timothy seed.

Successful exhibitions were held in December 1872 and 1873, for the sale and exchange of poultry.

The object of this association is to improve the condition of the farming community, to distribute new varieties of grains, plants and vegetables, and to adopt means of protecting its members from being swindled by unprincipled dealers and extortioners. To accomplish this a Conference Club, consisting of the several clubs of West Jersey, meets quarterly when matters of a general interest are introduced and discussed. One of the most prominent subjects before the club has been the consideration of providing a method of preventing the loss of boxes, baskets and crates by consignees. The club has also

promoted legislation to punish consignees, bailiffs, and others, for appropriating the funds arising from the sale of produce entrusted to them. The working of the association has proved satisfactory, and through its influence the members have secured better facilities for marketing their produce.

CAPE MAY COUNTY.

CAPE MAY COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED MARCH, 1870.

President—George H. Dare, Seaville.
Secretary—E. F. Westcott, South Seaville.

The annual meeting is held the last Saturday in February, and and exhibition in September.

"A farmers' club was organized November 8, 1869, the members of which formed an agricultural society the following spring, and held their first exhibition the next September. At the following session of the Legislature a charter was obtained for a stock company.

"The stock was subscribed for, and seventeen acres of land purchased and necessary buildings erected. The society has thus become a permanent institution.

"Our farmers' club has continued its meetings every Monday evening through the fall and winter months ever since its organization, and has done a vast amount of good to the county, and is really the mainspring of our county fair. The proceedings of the club are reported in our county papers and in the New Jersey Patriot. The meetings this winter are unusually interesting, from the fact that farmers are beginning to learn the value of such societies. Our club meets every week on Monday evening."

CAPE MAY AGRICULTURAL SOCIETY—ORGANIZED APRIL, 1870.

President—Dr. John Wiley, Cape May C. H.
Secretary—John Spaulding, Cape May C. H.
Treasurer—Coleman F. Leaming, Cape May C. H.
Number of Members, 50.
Meetings are held in April and July, and an exhibition in September or October.

The society is in a flourishing condition, with a surplus of about $700 in the treasury. "The Board of Directors expect soon to purchase several acres of land in this vicinity, upon which they will locate the exposition buildings and grounds permanently. It is generally conceded that our society has had a tendency to stimulate agriculturists in our county, and surely it has begotten a more social and friendly feeling among this worthy class of our community."

CUMBERLAND COUNTY.

CUMBERLAND COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED DECEMBER 8, 1851.

President—Charles Woodnutt, Bridgeton.
Vice Presidents—John Bonham, David McBride, David S. Gillman, A. R. Jones.
Secretary—Francis Danzenbaker, Bridgeton.
Number of Members, 485.

A meeting is held on the fourth Wednesday in January, and an exhibition in September, this year, the 23d. This society is believed to have greatly promoted the marked improvement which has taken place in the agriculture of the county, and it has also done much to awaken a feeling of mutual interest among the farming community. A member of the society furnishes the following statement:

"Our society is amongst the oldest in the State, and has not, as yet, failed in its annual show. It is in a prosperous condition, financially and otherwise, and the membership is increasing.

"We think this is in a great measure owing to the fact that here the horse has not been made the prominent figure, and horse-trotting the leading feature, as in many other places; and perhaps there is nothing to our credit in this, as we have not the horse stock to do it with.

"Instead of a racing day ours is a farmers' *fair-day*, on which he brings for exhibition the best his farm produces; meets his old friends and acquaintances, makes new ones, and he and his wife, and they and their wives, discuss the subject of crops and stock raising, the mode of farming, and all matters pertaining to their mutual interests. If nothing more than this was accomplished it would pay well. We are satisfied that the interest in the welfare of the society is increasing; and those of us who have been connected with it from the beginning see that farming is better and more profitably conducted; that the crops are larger; that the

stock of cattle, pigs and sheep is greatly improved as to blood, and care and attention given to it; that great attention is paid to the growing of all kinds of fruit for home use and a good market; and much of this we attribute to the influence, direct and indirect, exerted by this society."

VINELAND AGRICULTURAL SOCIETY—ORGANIZED OCTOBER, 1862.

President—Nelson Roberts, Vineland.
Recording Secretary—Richard Lush, Vineland.
Corresponding Secretary—Professor —— York, Vineland.
Treasurer—G. Wright, Vineland.
Librarian—William Jolly, Vineland.
Number of Members, 75.

Meetings are held every Saturday evening. Mr. Lush writes:

"We hold an agricultural, horticultural and floricultural fair annually, which is managed by a Fair Association. The Agricultural Society also have, every year, exhibitions of strawberries, &c., and, in the fall, of vegetables. We flatter ourselves that the influence of our society upon practical farming is good, as it awakens an interest and calls out facts and experiences that otherwise would not be made public. Weekly reports are published in our papers, and the public generally are interested.

"In consequence of the formation of farmers' clubs and other societies of similar aims, our membership is not so large as it has been, or as it should be in a population so largely engaged in fruit growing and general agriculture.

"There were shipped from Vineland the past autumn by railroad seven hundred and thirty tons of grapes; and, as near as we can estimate, three hundred tons more were shipped by wagons, sold at the depot, consumed at home, and used in manufacturing unfermented wine. There were also sent by rail five thousand two hundred crates of peaches, three thousand crates of pears, twenty thousand quarts of raspberries, fifty thousand quarts of strawberries, sixty-five thousand quarts of blackberries, besides large quantities of the above consumed at home. The sweet potato crop was not so large as usual, owing to dry weather. The Irish potato crop was large and the quality very fine."

FLORAL SOCIETY OF VINELAND—ORGANIZED 1864–65.

President—Mrs. N. R. Brown, Vineland.
Secretary—Mrs. Lucy D. Dyer, Vineland.
Treasurer—Mrs. —— White, Vineland.
Number of Members, 125.
Meetings are held every Saturday at the Methodist Vestry.
Exhibitions every fall, and at other times.

"Our society was incorporated in 1867. The society is carried on entirely by ladies, and also the business affairs managed by themselves. We are pleased to receive gentlemen as honorary members, and have the names of many who have or will grant us favors in any way. We have about one thousand dollars invested in land and otherwise. We usually unite with the Fair Association in the fall as the Floral Department. We have a bazar in April for the sale and exchange of plants. From fifty to sixty ladies in attendance each week. We have floral and literary matter at each meeting.

L. D. DYER, *Secretary.*"

HUNTERDON COUNTY.

HUNTERDON COUNTY AGRICULTURAL SOCIETY—ORGANIZED FEBRUARY 16, 1856.

President—John C. Hopewell, Flemington.
Vice Presidents—Caleb F. Fisher, George F. Crater.
Recording Secretary—John L. Jones, Flemington.
Corresponding Secretary—Richard S. Kuhl, Flemington.
Number of Members—350 (about).

Meetings of stockholders are held on the third Saturday of February, and an exhibition on the Tuesday, Wednesday and Thursday of the last week in September.

"Our society has been and is a great success, and its influence on practical farming in this community is eminently satisfactory."

UNION FARMERS' CLUB—(MOUNT AIRY).

President—Elisha S. Holcombe, Lambertville.
Vice President—Newton K. Young.
Secretary—F. S. Holcombe, Lambertville.
Treasurer—Gideon M. Brewer.
Number of Members—30.

Meetings are held on the first and third Saturdays of each month, from October to April, and on the first Saturday of each month from April to October. No exhibition is held, but samples of grain, fruit, vegetables, &c., are brought to the meetings of the club. At these meetings questions are assigned for discussion, and essays are read by the members and by ladies. The essays are occasionally

published in the county papers. The influence of the club is said to have been excellent in encouraging farmers to take more pains with their ordinary work, and to undertake useful experiments.

MERCER COUNTY.

THE FARMERS' ASSOCIATION OF PRINCETON—ORGANIZED IN 1840.

President—Hon. Charles S. Olden, Princeton.
Vice President—Ralph Guild, Princeton.
Secretary and Treasurer—Henry E. Hale, Princeton.
Number of Members limited to 20.

Meetings are held at the houses of the members, in turn, on the Saturday next before the full of the moon, in each month. The proceedings consist of essays, discussions and inspection of farms.

HOPEWELL FARMERS' CLUB—ORGANIZED DECEMBER 19, 1868.

President—Ralph Ege, Hopewell.
Vice President—Joseph M. Phillips, Hopewell.
Secretary—John M. Dalrymple, Hopewell.
Treasurer—William I. Phillips.
Number of Members, 18.

Meetings are held on the first and third Wednesdays of each month.

MIDDLESEX COUNTY.

MIDDLESEX COUNTY FARMERS' CLUB—ORGANIZED NOVEMBER 12, 1867.

President—Daniel McLaury, New Brunswick.
Vice President—James Neilson, New Brunswick.
Recording Secretary—G. H. Lambert, New Brunswick.
Corresponding Secretary—Henry K. How, New Brunswick.
Treasurer—Dr. A. D. Newell, New Brunswick.
Number of Members, 108.

Meetings are held at New Brunswick, on the first Monday of ea month.

"The meetings are chiefly devoted to discussions upon selected topics relating to farming or horticulture. The club is believed to exert a beneficial influence upon those farmers who attend its meetings, or who read the reports of its proceedings, as they are published in the newspapers of New Brunswick. The club has reason to believe that its discussions of 'Our Roads' has at least awakened or strengthened public interest in a subject so important to farmers." No exhibitions have yet been held, except an occasional "Poultry Show." That held in the winter of 1872–73 was unusually fine, and a decided success in every respect.

MONMOUTH COUNTY.

MONMOUTH COUNTY AGRICULTURAL SOCIETY—ORGANIZED DECEMBER 17, 1853.

President—Dr. Joseph C. Thompson, Freehold.
Vice Presidents—John W. Parker, Shrewsbury; George Schanck, Holmdel.
Corresponding Secretary—John C. Smock, Freehold.
Recording Secretary—J. J. Conover, Freehold.
Treasurer—C. A. Bennett, Freehold.
Number of Members—300.

Meetings are held on the third Thursday in January, and an exhibition in the second week in September. "The society is in a very flourishing condition, and ranks among the first in the State."

MONMOUTH COUNTY FARMERS' CLUB—ORGANIZED FEBRUARY 18, 1869.

President—Dr. Joseph C. Thompson, Freehold.
Vice President—J. F. Forman, Freehold.
Secretary—S. E. Thompson, Freehold.
Treasurer—J. Dorrance, Freehold.
Number of Members—74.

Meetings are held on the third Thursdays of March, June, September and December.

OCEAN COUNTY.

OCEAN COUNTY AGRICULTURAL SOCIETY.

President—George W. Cowperthwait, Toms River.
Secretary—J. W. Carmichael, Toms River.

This society is "hardly fairly at work yet."

SALEM COUNTY.

WEST JERSEY AGRICULTURAL AND HORTICULTURAL ASSOCIATION—INCORPORATED FEBRUARY 20, 1872.

President—Omar Borton, Woodstown.
Vice Presidents—John W. Dickinson, Woodstown; Robert Vanmeter, Pittsgrove; Alexander Black, Swedesboro; Dr. M. J. Paulding, Daretown.
Secretary—J. Morgan Barnes, Woodstown.
Treasurer—Isaac Scull, Woodstown.
Number of Members—280 (annual).
Number of Stockholders—73.

The association holds meetings in April, July and October, and its annual meeting on the third Thursday in January. An exhibition is held in September. The Secretary says:

"We think our association has been the means of creating an interest in the improvement of stock, fruits, grain and vegetables, as we find the displays of stock, cereals, fruits and vegetables improve with each returning year, and quite a spirit of laudable enterprise has manifested itself among the farmers in many ways."

SALEM COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED 1850.

President—R. M. Acten, Salem.
Secretary—David Petit, Salem.

"Exhibitions are suspended for the present."

SOMERSET COUNTY.

SOMERSET COUNTY FARMERS' AND MANUFACTURERS' ASSOCIATION—ORGANIZED JULY 16, 1870.

President—Rynier H. Veghte, Somerville.
Secretary—William S. Potter, Somerville.
Treasurer—L. R. Vredenburgh, Somerville.
Number of Stockholders, 300 to 400.

The annual meeting of Directors is held on the first Monday in December, and the annual meeting of stockholders on the third Saturday in February. An exhibition is held in the first week in October.

"The association had a struggle at the outset to overcome a widespread prejudice against a fair, from the fact that a previous society had died out as a county exhibition, from over-much attention to the speed of horses. The society as now organized is made up of stockholders from every section of the county, but few shares being held in any one locality, thus creating a general interest. It has held four annual fairs, with a steady improvement in point of numbers in attendance, and display of stock, agricultural products and machinery. In 1871 the managers purchased a tract of forty acres, with buildings and track complete, for $12,000; more than one-half of which has been paid. They are now paying off the balance at the rate of $1,000 per year. A by-law, adopted with great unanimity, forbids the offering of any premium for *mere* speed of horses. This has had a good effect, and has enlisted the support of many who had previously taken no interest in the annual fair."

UNION COUNTY.

UNION COUNTY FARMERS' CLUB—ORGANIZED DECEMBER 11, 1868.

President—John Crane, Union.
Vice Presidents—Noah W. Parcell, Lewis H. Wade, E. P. Beebe, B. W. Tucker.
Secretary and Librarian—Dennis C. Crane, Roselle.
Treasurer—Ogden Woodruff.
Number of Members, 26.

Meetings are held every other Thursday, and are conducted in a somewhat informal manner, the discussions being rather conversational than otherwise. No topics are discussed, except such as pertain especially to the interests of farmers. There is a library, from which members draw books. In the summer season social gatherings, at the houses of members, take the place of the regular meetings.

WARREN COUNTY.

WARREN COUNTY FARMERS', MECHANICS' AND MANUFACTURERS' ASSOCIATION—ORGANIZED, 1859.

President—John V. Deshong, Belvidere.
Secretary—J. T. Kern, Belvidere.
Treasurer—Israel Harris, Belvidere.

An exhibition is held the first Tuesday in October.

The following came too late for insertion in its proper place:

GLOUCESTER COUNTY.

WOODBURY FARMERS' CLUB.

President—Joseph Carter.
Vice President—Daniel J. Packer.
Secretary—Charles W. Knight.
Corresponding Secretary—D. Cooper Andrews.
Treasurer—James Budd.

At the meeting of the Board of Agriculture, in Trenton, on the 25th of February, 1874, the times for the meetings of the coming year, were fixed as follows:

Last Wednesday in May, at the Agricultural College Farm, New Brunswick.

Fall meetings to be in committees appointed by the Secretary, at various county fairs.

Next annual meeting, at Trenton, on the third Wednesday in February, 1875.

The following resolutions were also passed:

ON THE CENTENNIAL.

1. *Resolved*, That the State Board of Agriculture hereby expresses its most earnest interest in the proposed Centennial Exposition, and regards it as especially incumbent on the State of New Jersey, on account of its intimate connection with many of the most important events of the Revolutionary period, to do its full share in making it a grand national success.

2. *Resolved*, That local Agricultural Societies throughout the State be respectfully recommended to take early measures for securing a full representation of the agricultural and mechanical products of their respective localities at that exposition.

ON DISEASES OF CATTLE.

Resolved, That the Executive Committee be instructed to prepare a bill for the prevention or stopping of pleuro-pneumonia and other contagious diseases of cattle, and present the same to the legislature for its action.

ON THE SALE OF FERTILIZERS.

Resolved, That the Executive Committee be instructed to prepare a bill, and, if possible, secure its passage through the present legislature, regulating the manufacture and sale of commercial fertilizers.

ON ROAD LAWS.

Resolved, That the Executive Committee be directed to inquire into the subject, obtain information from other States, and report the form of a good and effective road law at the next meeting.

LIST OF PLANTS.

The secretary invites correspondence with botanists and persons interested in botany, for the purpose of getting a list of the native and naturalized plants of the State.

CONTENTS.

SECOND ANNUAL REPORT

OF THE

NEW JERSEY

STATE BOARD OF AGRICULTURE

FOR THE YEAR ENDING 1874.

TRENTON, N. J.:
PUBLIC OPINION—WM. S. SHARP, BOOK AND JOB PRINTER.

1875.

OFFICERS OF THE BOARD.

PRESIDENT:

HON. JOEL PARKER, ... *Freehold.*

SECRETARY:

GEO. H. COOK, ... *New Brunswick.*

EXECUTIVE COMMITTEE:

WM. M. FORCE, ... *Newark.*

HENRY K. HOW, ... *New Brunswick.*

GEORGE W. ATHERTON, ... *New Brunswick.*

P. T. QUINN, ... *Newark.*

GEORGE H. COOK, ... *New Brunswick.*

REPORT.

To the Legislature of the State of New Jersey, in Senate and General Assembly convened:

The State Board of Agriculture respectfully present their report for the year 1874, upon the subjects committed to their charge, by the action of your honorable body, in the act constituting this Board, which was approved April 4th, 1872.

The year which has just passed has not been a prosperous one for farmers. The financial difficulties of the country have been attended with a gradual decline in the prices of produce, and they have also diminished, to a remarkable extent, the demand for fruits and garden products which are among the comforts and luxuries, but are not absolutely necessary to support life. Some parts of the State, too, have suffered from the effects of a protracted drouth. The average crops throughout the State have, however, not fallen materially below that of former years.

The main difficulties which affect the business prosperity of the farmer, are of a kind which may, to a large extent, be provided against and overcome by proper preparation and precaution. Skill, persevering industry, and proper frugality, are the essentials to success in agriculture, and without them failure is the necessary consequence. But having them success is sure, and the farmer who joins to them the largest measure of intelligence will gain the largest returns. To help in raising up a race of such farmers is the work of this Board.

There is less that is exciting and attractive in farming than in most other branches of industry. Its returns are slow, and in proportion to the capital invested, its profits are small. The manufacturer may turn his capital several times in a year, while the farmer expects to get back but a small portion of his each year. In 1870 the capital invested in agricultural lands and implements in New Jersey, was $265,000,000, while that in manufactures and mining was only $80,000,000; but the value of the products of agriculture were only $46,000,000, while that of manufactures was $169,000,000. But the returns from agriculture are sure and less fluctuating than those of manufactures, and taking a series of years together the accumulations are larger, and more uniformly distributed among the whole number of persons engaged.

The value of the products of our agriculture are sufficiently large

to be worthy the attention of every friend of productive work. And yet they are small compared with what they may be made. The crops of wheat, rye, oats, and corn, average but little more than half what they should, and most of our other crops could be greatly increased; and this too, without a corresponding increase in expense for capital or labor.

The means of increased production must be found in a more liberal and judicious use of fertilizers, better management and tillage of the soil, and a more careful selection of crops and stock for our different soils and markets.

At the meeting of this Board in February last, the Executive Committee were "instructed to prepare a bill, and if possible, secure its passage through the present Legislature, regulating the manufacture and sale of commercial fertilizers." The bill was prepared, and passed through the Legislature, and a copy is printed here.

"AN ACT TO REGULATE THE MANUFACTURE AND SALE OF FERTILIZERS.

1. "BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That every commercial fertilizer which shall be offered for sale in this state shall be accompanied by an analysis, stating the per centage therein of ammonia or its equivalent of nitrogen: of potash in any form or combination soluble in distilled water: and of phosphoric acid in any form or combination, the portion of phosphoric acid soluble in distilled water, that portion soluble in a neutral solution of citrate of ammonia at a temperature not exceeding one hundred degrees Fahrenheit, and that portion of phosphoric acid not soluble in either of the above named fluids, shall each be determined separately; and the material from which the phosphoric acid is obtained shall also be stated. A legible statement of such analysis shall accompany all packages or lots of over one hundred pounds, sold, offered or exposed for sale.

"2. *And be it enacted*, That the chemist of the State Board of Agriculture shall be the inspector of fertilizers; it shall be his duty to analyze one or more samples of every kind of commercial fertilizers coming within the provisions of this act, which may be offered for sale within this state, and of which he shall be informed.

"3. *And be it enacted*, That manufacturers, dealers, and all persons interested may obtain an analysis by notifying the chemist of the State Board of Agriculture, upon which notification he shall be authorized to analyze at his discretion, samples selected by himself, and to furnish certified copies of such analysis to the person on whose application they were made; and it shall also be his duty to report all such analyses to the State Board of Agriculture.

"4. *And be it enacted*, That the chemist of the State Board of

Agriculture shall receive for each certificate of analysis made by him, a sum not to exceed fifteen dollars, to be paid by the person or persons applying therefor.

"5. *And be it enacted,* That any person selling, offering or exposing for sale any commercial fertilizer without the analysis required by the first section of this act, or with an analysis stating that said fertilizer contains a larger per centage of any one or more of the constituents mentioned in said section than is contained therein, shall forfeit fifty dollars for the first offence, and one hundred dollars for each subsequent offence.

"*Approved March* 24, 1874."

In accordance with this law a number of fertilizers have been sent to the Secretary of this Board, and he has had them analyzed by Mr. Edwin H. Bogardus, a competent and careful chemist: and samples are kept, so that if any question regarding them should hereafter arise, they can be re-examined. These analyses have been inserted in this report, and will be found in the article on Commercial Fertilizers and their valuation. They comprise only a few of the numerous brands of fertilizers sold in the state; but there is a prospect that the number will be much increased the present year. And when the law becomes so far operative as to cause every package containing a Commercial Fertilizer to have on it a plain and trustworthy statement of its composition, it will have accomplished its work. To effect this object we ask the aid of every farmer or dealer in fertilizers in the state.

VALUATION OF FERTILIZERS.

The value of commercial fertilizers is, by common consent, both in Europe and in America, calculated from their chemical components, which are ascertained by their analysis. It is also allowed that ammonia, phosphoric acid, and potash, are the only constituents, in a fertilizer, costing $15 or upwards per ton, that shall ordinarily be taken into account.

Experience has proved that these three substances are powerful fertilizers, and that they can be profitably used by farmers. The price per pound, at which each of them shall be rated, must be found from the lowest market rates of the commercial substance containing them. To establish prices for them, now, in the autumn of 1874, the following data may be taken as the basis, using the present wholesale prices in New York and Philadelphia:

Ammonia can be got cheapest at the present time from sulphate of ammonia, which sells at $5\frac{1}{2}$ cents per pound; or the equivalent of ammonia from nitrate of soda, which sells at $3\frac{3}{4}$ cents per pound. Commercial sulphate of ammonia contains from 25 to 29 per cent. of ammonia. A sample analyzed here contained 25 per cent., and we

may use this for our standard. The 25 pounds of ammonia in 100 pounds of sulphate of ammonia are then worth $5.50, which is 22 cents per pound.

Nitrate of soda, of 96 per cent. purity, contains the equivalent of 19 per cent. of ammonia; and 19 pounds of ammonia in the 100 pounds of nitrate of soda, is worth almost 20 cents per pound.

As nitrate of soda is not so well known in our country as sulphate of ammonia, it is safest to adopt the price derived from the latter, which is 22 cents per pound.

Phosphoric acid in its soluble form is cheapest in some of the super-phosphates made from phosphatic guano or from mineral phosphates. Such super-phosphates, guaranteed to contain 11 per cent. of soluble phosphoric acid, can be bought for $25 a ton; the ton contains, at this rate, 220 pounds of the soluble phosphoric acid; as 220 pounds cost $25, one pound costs almost 11½ cents.

Phosphoric acid in its reverted form, is only this acid changed from the preceding and is variable in quantity, and not intentionally for sale but as it is in the super-phosphates, and in many cases increases in quantity as the time they are kept lengthens, its price must be estimated from the experience of those who use it. Some farmers consider it quite equal to the soluble phosphoric acid; but it is usually considered to be a little less valuable. A fair price for it is 10 cents per pound.

Phosphoric acid in its insoluble form, as in animal bones, may have a price made out from the rates at which bone dust is sold. Bone dust containing 29 per cent. of phosphoric acid, and 2 per cent. of ammonia, can be bought for $35 a ton. The 2 per cent. of ammonia amounts to 40 pounds in the ton. This ammonia is still in its elements and should not be estimated at above 15 cents per pound, or the whole at $6, which would reduce the cost of the phosphoric acid in the bone dust to $29. The ton contains 580 pounds of it, and of course if 580 pounds are worth $29, one pound is worth 5 cents, which may be taken as the standard price. The insoluble phosphoric acid from mineral phosphates is not worth so much, and by many is thought to be of no value.

Potash can be purchased in the form of muriate of potash at the lowest rates. That salt of potash is now selling at $2.75 per hundred, at 80 per cent. purity; it contains 50 per cent. of potash, which of course must be considered as being worth $2.75 or 5½ cents a pound.

PRICES:

Ammonia, per pound,	22 cents.
Soluble phosphoric acid, per pound,	11½ "
Reverted " " " "	10 "
Insoluble " " " "	5 "
Potash, " "	5½ "

By the use of these prices, the value of any fertilizer of which an analysis is given can be calculated, remembering that the per centage of any constituent given in the analysis, if multiplied by 20 will show the number of pounds of that constituent in a ton; thus the Guanape guano given further on, is estimated as follows:

	Analysis.		Pounds.	
Ammonia,	11.61×20	=	232 @ 22 c.	$51 04
Soluble phrs. acid	4.83×20	=	96 @ $11\frac{1}{2}$	11 04
Reverted " "	7.00×20	=	140 @ 10	14 00
Insoluble " "	3.82×20	=	76 @ 5	3 80
Potash,	$.90 \times 20$	=	18 @ $5\frac{1}{2}$	99
				$80 87

The price at which this guano sells is $70 a ton.

The following fertilizers have been analyzed in our laboratory this year:

GUANAPE GUANO.

	Per cent.
Ammonia	11.61
Soluble phosphoric acid	4.83
Phosphoric acid soluble in neut. citrate of ammonia	7.00
Insoluble phosphoric acid	3.82
Potash	.90
Lime	12.00
Sulphuric acid	6.26

PHOSPHATIC GUANO, FROM LITTLE CURACOA.

Bone phosphate of lime	62.22
Carb. of lime	19.62
Carb. of magnesia	3.27
Sulphate of magnesia	1.12
Common salt	1.10
Insoluble matter	.68
Water and organic matter	11.60

It contains 28.57 per cent. phosphoric acid.

MAPES' SUPER-PHOSPHATE.

Phosphoric acid, soluble in water	6.45
" " " " citrate of ammonia	1.42
" " insoluble (from bone black),	5.44
Sulphuric acid	16.84
Lime	14.91
Ammonia	3.40

WALTON & WHANN'S SUPER-PHOSPHATE.

Phosphoric acid, soluble in water	3.07
" " insoluble	7.62
Sulphuric acid	14.06
Lime	16.07
Ammonia	3.29

MORO PHILIPS' SUPER-PHOSPHATE.

Phosphoric acid, soluble in water	6.80
" " insoluble	13.18
Sulphuric acid	21.54
Lime	25.96
Potash	.90
Ammonia	.90

STERNFELS' AMMONIATED DISSOLVED BONE.

Phosphoric acid, soluble in water	3.84
" " insoluble	1.53
Ammonia	1.70

TEXAS BONE MEAL.

Bone phosphate of lime	42.41
Carbonate of lime	6.18
Animal matter	38.50
Insoluble matter, mostly sand	11.50

It contains:

Phosphoric acid	21.00 per cent.
Ammonia	3.63 "

FISH GUANO, TUCKERTON.

Phosphoric acid, insoluble	4.02
" " soluble in water	.47
Ammonia	4.80
Potash	.29
Water	51.24

FISH GUANO, WALTON & WHANN.

Phosphoric acid, insoluble in water	4.09
Ammonia	5.05
Potash	2.40
Common salt	29.50
Water	10.53

SULPHATE OF LIME, FROM RANCOCAS PHOSPHORUS WORKS.

Lime	33.04
Sulphuric acid	42.23
Phosphoric acid	4.10
Insoluble matter, (sand, &c.,)	4.50
Water	16.

CHLORIDE OF POTASSIUM.

Potassium chloride	86.98
Common salt	12.62

SUGAR HOUSE SCUM.

Organic matter	42.2
Ash	7.8
Water	50.2

The organic matter yields 2.5 per cent. of ammonia.

LEACHED WOOD ASHES, FROM CANADA.

1. Water		39.00
2. Soluble in water—		
Potash	.30	
Chlorine	.18	
Sulphuric acid	.28	
Lime	.26	
		1.02
3. Soluble in acids—		
Potash	.46	
Lime	28.43	
Magnesia	2.73	
Carbonic acid	19.70	
Phosphoric acid	1.82	
		53.14
4. Insoluble in acids		6.50
		99.66

Almost the only fertilizing substance in these ashes is fine carbonate of lime, which we should expect could be more cheaply got in common slaked lime, but they are much liked by farmers and sell readily at from twenty to twenty-five cents a bushel.

The value of the fertilizers put down above can be computed from the prices given, but some variations from this will always be made

on account of the mechanical condition of the fertilizer; that which is the dryest and finest giving the quickest and most satisfactory returns; and many fertilizers which are not very rich in composition have an excellent reputation on this account.

The manufacture and sale of commercial fertilizers in our country is increasing rapidly, and has already reached very large proportions. The following estimate of the amounts made and sold in the different states, was prepared for this report by Geo. E. White, Esq., dealer in Commercial Fertilizers, and Chemical Manures, at 160 Front street, New York City.

SUPER-PHOSPHATES.

Maine,	2,500 tons.
Massachusetts,	30,000 to 35,000 "
Rhode Island,	3,000 "
Connecticut,	3,000 "
New York,	25,000 to 28,000 "
New Jersey,	10,000 "
Pennsylvania,	5,000 "
Maryland,	30,000 "
Delaware,	10,000 "
N. Carolina,	8,000 "
S. Carolina,	25,000 "
Georgia,	3,000 "
Ohio, Indiana, Missouri, Alabama, and Louisiana,	10,000 "

PERUVIAN GUANO.

Whole amount of sales, say	10,000 "

CHEMICAL MANURES.

Sulphate ammonia, nitrate soda, etc.,	4,000 "
Total,	201,500 to 209,500 tons.

In this estimate of Mr. White, no account is given of the bone dust that is made and sold in the country. It must be very large, however. The sales of Lister Brothers, of Newark, must amount to 6000 or 8000 tons yearly.

A circular was sent by the secretary of the Board to each of the Agricultural Societies and Farmers Clubs in the State as far as known, asking "what commercial fertilizers are used in your district or county," and "are fertilizers made in your county, and if so, please give address of maker, titles of articles, amount made, and the price." The following have been received:

J. T. Kern, of Belvidere, and secretary of the "Warren county Farmers, Mechanics and Manufacturers Association," says: (1.) "There are no commercial fertilizers used in our county, our farmers relying mostly upon barn yard manure, compost and lime for fertilizing the soil. (2) We have no manufacturers of fertilizers in the county except as above stated."

Dennis C. Crane, of Roselle, and secretary of the "Union County Farmers Club," says: (1.) "We use no commercial fertilizer to any great extent; stable manures from the neighboring cities are mostly sought after and considered the cheapest. For two years back we have ordered and used for compost in the spring two sloop loads of the Lodi Poudrette, office in New York City, and later in the summer, two canal boat loads of Canada ashes, the latter for grass principally. Some lime is used, but little super-phosphate. (2.) We have two factories manufacturing fertilizers, viz:

Russell Coe's ammoniated bone super-phosphate of lime, factory on the Rahway river at Linden.

Sternfel's Bone Fertilizing Company, factory near Linden; office 194 Water street, New York.

In Elizabeth there is an oyster-shell lime kiln owned by Beer & Winans."

Wm. S. Potter, of Somerville, secretary of the "Somerset County Farmers and Manufacturers Association," replies as follows:

(1.) Lime and plaster generally used; also bone dust, ashes and poudrette; gas lime to some extent. (2.) Lime is extensively burned at Peapack."

Ferdinand S. Holcombe, of Mount Airy, Hunterdon county, and Secretary of the "Union Farmers' Club," replies: (1.) "A number of our farmers are trying, this fall, different fertilizers, such as salt, salt and lime, Moses' bone dust, (from Trenton,) Ralston's bone, (Ralston & Kirke, 170 Front street, New York,) Lister's bone, (from Newark,) and some bone dust from Chicago. Baugh's phosphate is also used. A number of farmers use these on sod for corn the following year, and phosphate or bone for wheat. (2.) No fertilizers made in the county."

Henry E. Hale, of Princeton, Secretary of the "Farmers' Association of Princeton," writes, in reply to question, (1.) "The commercial fertilizers used in this vicinity are, lime, marl, plaster, bone dust, super-phosphate, guano, and Manhattan Company's blood phosphate, (166 Front street, New York.) (2.) Bone, ground in Trenton, by Moses & Bro., and sold at $50 per ton; super-phosphate, made by the same firm, and sold at the same price."

Henry K. How, New Brunswick, Secretary of the "Middlesex County Farmers' Club," sends the following answers: (1.) "Most of the commercial fertilizers are used in our county. Stable manure, night-soil, gas-lime, and leached ashes are extensively used along the

shores of the Raritan, and the Delaware and Raritan canal, wherever cheap transportation from New York can be had. Lime is burned in New Brunswick, and is much used by farmers; and green-sand marl is largely used in the southern part of the county. (2.) There are no manufacturers of fertilizers in the county."

S. E. Thompson, Freehold, Secretary of the "Monmouth County Farmers' Club," writes: (1.) "Being situated among the marl beds, commercial fertilizers, excepting lime, are not used to a *very great* extent, although guano, poudrette, blood guano, ground bone, and phosphates are used, especially in truck farming. (2.) I know of no fertilizers made in the county, excepting a fish-pumice, made at Port Monmouth, being the residue, after pressing out the oil. The price is about $15 per ton. It is said to be excellent for composting."

H. I. Budd, Mount Holly, Secretary of the "Burlington County Farmers' Club," says that in his county, (1.) "The commercial fertilizers generally used are, Baugh's, Whann's super-phosphate and ground bone, from Wilmington, Delaware; R. C. Allen's ground fish guano, and a raw fish guano from the vicinity of Tuckerton. (2.) The only manufactory of commercial fertilizers in the county, is that of Gibbs & Deacon, at Mount Holly; they manufacture super-phosphate. During the year 1873 this firm made 200 tons of this fertilizer. Its price is $35 to $40 per ton."

Mark H. Busby, Masonville, Burlington county, Secretary of the "Progressive Farmers' Club, of Burlington County," says: (1.) "Peruvian guano, Whann's phosphate, fish guano, and bone meal are used. (2.) Gibbs & Deacon, near Masonville, manufacture a fertilizer called bone-phosphate, from the refuse of a phosphorus factory—price, $45 per ton."

Joseph Carter, Woodbury, Gloucester county, President of the "Woodbury Farmer's Club," replies in reference to (1.) "Cancerine, or king crab and fish guano, direct from the shore, and Peruvian guano, (which a great many think is not so good as formerly) are the principal commercial fertilizers used in this district of country. (2.) No fertilizers are made in this county."

David Petit, of Salem, writes as follows: (1.) "There has been about 1200 tons of commercial fertilizers sold and used in this county, the last year. Above half of this amount was what is called here 'Orchilla guano.' A guano under this name was sold here the year before, and proved so successful, for the price ($30 or $35 per ton, I think,) that one under that name has taken the lead of all others, last year. (2.) No commercial fertilizers made in Salem county."

J. Morgan Barnes, Woodstown, Salem county, Secretary of the "West Jersey Agricultural and Horticultural Association," (1.) "says that the commercial fertilizers used in Salem county are, ground bone, fish guano, super-phosphates, and guano. (2.) N. Y. Lippincott,

Auburn, Salem county, manufactures McKimm's Excelsior Phosphate."

F. S. Regensburg, Egg Harbor City, Atlantic county, publisher of the *Atlantic Democrat,* sends these answers, viz.: (1.) "Bone dust and fish guano are the commercial fertilizers used in this district. (2.) No fertilizers manufactured."

These are all the replies that have been received, but they do not, by any means, indicate the amount of fertilizers used or manufactured in the State. Lister Brothers, in Newark, are very large manufacturers of bone manures. Cancerine has been manufactured by Hon. Thos. Beesley, of Cape May Court House, for a number of years past. Green-sand marl is sent in great quantities by the Squankum & Freehold Marl Company, from Farmingdale, by the Squankum Marl Company, from the same place; by the Cream Ridge Marl Company, from Hornerstown; by the Pemberton Marl Company, from Pemberton; Vincentown Marl Company, from Vincentown; by Minor Rodgers, from White Horse; by the West Jersey Marl Company, from Barnsboro; and by Messrs. Dickinson, from Woodstown. In addition to the large quantities which are hauled away by teams from marl-pits in all parts of the marl region, 135,000 tons were sent off by railroad last year. Lime is burned in large quantities in Warren and Hunterdon counties, and, to a smaller extent, in Sussex and Somerset, and is relied upon as a manure by farmers.

Barn-yard and stable manures are, however, the main dependence of the farmer in all places. A good farm should produce yearly at least two tons of barn-yard manure to each acre of its cleared area; and, by good management, some reach three tons per acre. There are 2,000,000 acres of cleared land in New Jersey, and if all the acres in the State should yield this, there would be 4,000,000 tons a year—worth fully $6,000,000.

THE EFFECTS OF DIFFERENT KINDS OF FERTILIZERS.

The different kinds of fertilizers used have specific effects upon the various crops raised, some being more needed for one crop, and others for another, though, usually, all of them have some effect. Experiments to ascertain their peculiar effects, are expensive and troublesome to make, and on account of the variations of seasons, soils, &c., they must be repeated many years before reliable conclusions can be deduced from them. In our country we have such experiments now in progress, but they have not yet been continued long enough to be conclusive. The most interesting and instructive series of experiments made for this purpose that we have, are those made by J. B. Lawes, Esq., and Dr. J. H. Gilbert, on the lands of Mr. Lawes, at Rothamsted, Herts, England, which have now been made continuously every

year, from 1844 to the present time. The Secretary of this Board had the opportunity of inspecting the land and crops which were the subjects of these experiments, in the summer of 1870, and can testify to the eminent ability which has devised and sustained them, and to the conscientious accuracy with which they have been carried out.

Mr. Lawes' experiments have been made upon grass, wheat, barley, oats, beans, clover, turnips, and sugar-beets; and on the proper rotation of crops; and on economizing in the use of expensive fertilizers. He gives an annual report of his experiments and their progress. We condense here from his reports on permanent meadow, wheat, and oats, the principal part of his results:

Experiments with Different Manures on Permanent Meadow Lands.—The land has probably been laid down with grass for some centuries; no fresh seed has been artificially sown within the last 40 years, certainly; nor is there record of any having been sown since the grass was first laid down. The experiments commenced in 1856, at which the character of the herbage appeared uniform over all the plots, excepting as explained below, the same description of manure has been applied year after year to the same plot.

The area under experiment was 7 acres, and each plot contained very near one-third of an acre. Plots 1, 2, 6, 8 and 10—the two numbers refer to the same plot, but the manures were changed. Plots 4 and 11 were divided.

The average is per annum for 18 years, (1856–1873) except where the manures were changed, or new experiments began. In the latter the average is for the period since the changes or new experiments began.

No. of Plot.	MANURES PER ACRE. Farm-yard Manures (tons.)	Ammonia Salts, (pounds.)	Super-phosphate (pounds.)	Potash Salts, &c. (pounds.)	Nitrate of Soda, (pounds.)	Silicate of Soda, (pounds.)	Cut wheat straw, (pounds.)	WEIGHT OF HAY PER ACRE. (pounds.) 1869.	1870.	1871.	1872.	1873.	Average per annum.	Number of years.
1	14	200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,544	8
1	.....	200	.....	.....	.....	.....	.....	6,832	1,820	4,900	3,528	3,332	4,578	10
2	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,802	8
2	.....	.....	.....	.....	.....	.....	.....	6,188	1,554	3,794	2,828	2,114	3,934	10
3	.....	.....	.....	.....	.....	.....	.....	3,696	644	2,842	1,638	1,372	2,450	18
4	.....	.....	392	.....	.....	.....	.....	4,508	812	2,786	1,764	1,512	2,632	15
4½	.....	400	392	.....	.....	.....	.....	5,096	924	4,284	3,192	2,912	3,934	15
5	.....	400	.....	.....	.....	.....	.....	3,990	588	3,318	2,520	1,890	3,080	18
6	.....	400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,416	13
6	.....	.....	392	500	.....	.....	.....	6,328	1,820	4,200	2,828	2,912	3,612	5
7	.....	.....	392	500	.....	.....	.....	6,118	1,960	4,410	4,228	3,892	3,976	18
8	.....	.....	392	600	.....	.....	.....	.....	.....	.....	.....	.....	4,032	6
8	.....	.....	392	350	.....	.....	.....	5,194	1,428	3,360	2,562	2,058	3,192	12
9	.....	400	392	500	.....	.....	.....	7,700	3,304	6,580	5,656	4,900	5,838	18
10	.....	400	392	600	.....	.....	.....	.....	.....	.....	.....	.....	6,116	6
10	.....	400	392	350	.....	.....	.....	6,412	2,380	5,208	4,326	3,416	4,900	12
11	.....	800	392	500	.....	.....	.....	8,428	4,746	6,342	7,126	5,236	6,748	18
11½	.....	800	392	500	.....	400	.....	8,792	4,544	7,364	7,154	6,328	7,308	18
12	.....	.....	.....	.....	.....	.....	.....	4,340	1,260	2,954	2,254	2,206	2,744	18
13	.....	400	392	500	.....	.....	2000	8,694	5,376	7,056	7,014	6,384	6,454	18
14	.....	.....	392	500	550	.....	.....	8,526	6,300	6,930	6,216	5,796	6,426	16
15	.....	.....	.....	.....	550	.....	.....	5,964	1,736	4,326	3,654	3,780	4,074	16
16	.....	.....	392	500	275	.....	.....	7,344	3,752	6,384	4,480	4,662	5,334	16
17	.....	.....	.....	.....	275	.....	.....	6,132	2,156	4,312	3,318	3,192	3,892	16
18	.....	.....	.....	.....	.....	.....	.....	6,230	1,638	4,242	3,738	2,926	3,696	9
19	.....	.....	392	290	275	.....	.....	.....	.....	.....	4,480	4,326	5,238	2
20	.....	.....	392	327	.....	.....	.....	.....	.....	.....	4,212	4,032	4,172	2

MANURES.—*The Ammonia Salts* consist of equal parts of commercial muriate and sulphate of ammonia. In 1859–60–61 only 400 pounds were used on both plots 11.

The Super-Phosphate was made from 200 pounds of bone-ash and 150 pounds of sulphuric acid, (sp. gr. 1.7.)

The Potash Salts, &c., was a mixture of 300 pounds of sulphate of potash, 100 pounds of sulphate of soda, and 100 pounds of sulphate of magnesia. Excepting first 8 and first 10 plots, which have 100 pounds sulphate of soda, additional; second 8 and second 10, which had no sulphate of potash, and had 250 pounds of sulphate of soda; plot 19, which had 290 pounds of sulphate of potash, and 275 pounds of nitrate of soda; and 20, which had nitrate of potash. On plot 7, 200

pounds of sulphate of soda was used for the first seven years, and on plot 8, 500 pounds of sulphate of soda was used in 1862–63.

The Nitrate of Soda was used instead of *ammonia salts*, 550 pounds of the former being considered equal to 400 pounds of the latter.

The Silicate of Soda was not used until 1862.

Sawdust to the amount of 2000 pounds per acre was applied on plots 6, 8, and 10, for the first seven years, but without effect, and on plot 4 for three years.

The study of the above table and its results will richly repay any enterprising farmer. Mr. Lawes has not failed to make his comparisons by a reference to barnyard manure, which, after all, is the chief reliance of the farm. The importance of continuing the experiments for a number of years is shown by these results. The season of 1870 was remarkable, in England, for its dryness. There was no rain in May, June, or July, and the effects of the drought was unusually severe. It is interesting to notice that the unmanured plots suffered most in proportion to their average product, and, in fact, that the damage is somewhat approaching a constant quantity or nearly of the same amount in all of them. On plot 13 a ton of cut straw per acre was used, and it was next to the best in withstanding drought; and the straw was a sufficient substitute for 400 pounds of ammonia salts. On plot 14, where nitrate of soda was used with super-phosphate and potash, the very best results were had in that dry season.

The table shows that chemical manures can be made to take the place of those from the barnyard, on growing grass.. It also shows that while all the constituents of a manure are needed to produce good crops, the very best are only produced when the land is liberally dressed with manures containing nitrogen.

Experiments on the growth of wheat, year after year on the same land; without manure, and with different kinds of manure.

The soil is a somewhat heavy loam, with a subsoil of raw, yellowish red clay, but resting in its turn upon chalk, which provides a good natural drainage.

Previous cropping—1839, turnips, with farm-yard manure; 1840, barley; 1841, peas; 1842, wheat; 1843, oats; the last four crops unmanured.

First experimental wheat crop in 1844. Wheat every year since; and, with some exceptions, nearly the same description of manure on the same plots each year—especially during the last twenty-three years—(1852 and since). Unless otherwise stated, the manures are sown in the autumn before the seed.

Area under experiment—about thirteen acres; of each plot six-tenths of an acre.

The manures are given at the rate per acre, and the amount is that put on each year.

No. of Plot.	MANURES.								Average per annum, 20 years. 1852–1871.		THIRTIETH SEASON, 1873.	
	Farm yard Manure, (tons.)	Ammonia Salts, (pounds.)	Super-phosphate of Lime, (pounds.)	Sulphate of Potash, (pounds.)	Sulphate of Soda, (pounds.)	Sulphate of Magnesia, (pounds.)	Nitrate of Soda, (pounds.)	Rape cake, (pounds.)	Wheat, (bushels.)	Straw, (pounds.)	Wheat, (bushels.)	Straw, (pounds.)
0	.....	.....	1,176	.....	.....	.....	.....	.....	17¾	1,708	15⅝	1,190
1	.....	.....	.....	400	200	200	.....	.....	15⅛	1,554	10½	966
2	14	.....	.....	.....	.....	.....	.....	.....	35⅝	3,794	26¾	2,464
3	.....	.....	.....	.....	.....	.....	.....	.....	14½	1,456	11¾	896
4	.....	.....	.....	.....	.....	.....	.....	.....	15¾	1,550	12⅛	994
5	.....	.....	392	200	100	100	.....	.....	17	1,708	12¾	1,050
6	.....	200	392	200	100	100	.....	.....	26⅜	2,774	15⅝	1,526
7	.....	400	392	200	100	100	.....	.....	35¼	3,962	22	2,016
8	.....	600	392	200	100	100	.....	.....	38¼	4,634	27½	2,660
9	.....	.....	392	200	100	100	550	.....	36¾	4,648	35⅝	3,934
9½	.....	.....	.....	.....	.....	.....	550	.....	26	3,192	21¼	2,352
10	.....	400	.....	.....	.....	.....	.....	.....	22½	2,422	19⅛	1,638
10½	.....	400	.....	.....	.....	.....	.....	.....	25⅞	2,772	20⅝	1,638
11	.....	400	392	.....	.....	.....	.....	.....	28	2,954	19¼	1,582
12	.....	400	392	.....	366½	.....	.....	.....	33⅞	3,626	22⅞	1,988
13	.....	400	392	200	.....	.....	.....	.....	33⅝	3,794	23⅝	2,072
14	.....	400	392	.....	.....	280	.....	.....	33⅞	3,682	24⅛	2,142
15	.....	400	392	200	100	100	.....	.....	32⅝	3,612	32⅝	2,996
15½	.....	400	392	200	100	100	.....	.....	34	3,794	32⅜	3,164
16	.....	800	392	200	100	100	.....	.....	39½	5,222	.....	.....
16	.....	.....	.....	.....	.....	.....	.....	.....	17⅞	1,750	17⅞	1,148
17	.....	400	392	200	100	100	.....	.....	31⅝	3,500	20⅝	1,904
18	.....	.....	.....	.....	.....	.....	.....	.....	17⅝	1,806	11¾	1,106
19	.....	300	392	.....	.....	.....	.....	500	30¾	3,262	20	1,806
20	.....	.....	.....	.....	.....	.....	.....	.....	15½	1,624	12⅓	1,092
21	.....	100	392	200	100	100	.....	.....	21⅜	2,184	14⅞	
22	.....	100	392	200	100	100	.....	.....	21	2,128	18⅛	

MANURES.—*The Ammonia Salts* consist of equal parts of commercial sulphate and muriate of ammonia, except on plots 19 and 22, sulphate of ammonia, and on 21 muriate of ammonia was used; and on 15 400 pounds, and on 15½ 300 pounds of sulphate of ammonia, sown in autumn, were used, previous to 1873.

The Super-Phosphate, excepting on plot 19, was made with 200

pounds of bone-ash and 150 pounds of sulphuric acid, (sp. gr. 1.7.) On 19, and that used on 15 and 15½, for 1872 and previously, was made with muriatic acid instead of sulphuric acid.

The Sulphate of Potash, and Sulphate of Soda; in 1858 and previously, 300 pounds of the potash and 200 pounds of the soda salt were used except on plot 1, on which the amount was not changed. In the comparative experiments with these salts and sulphate of magnesia, on plots 12, 13, and 14, the amounts were 50 per cent. greater for 1858 and previously.

The Nitrate of Soda used on 9½ was varied in amount from 275 to 550 pounds, until 1852.

The Rape Cake; on 15½, 500 pounds of this manure was sown in autumn for 1872 and previously.

On plots 17 and 18 the ammonia salts and the mineral manures were alternated so as to bring each of these manures on each plot every other year. The larger yields every year were upon the plots manured with ammonia salts; and the average crops put down in the table opposite 17 and 18 are those raised with the two different manures.

Plots 3 and 4, marked as without manure, differ in that previous to 1853 4 was manured with sulph. amm. and super-phosphate made with muriatic acid.

Plots 10 and 10½ differ in that the latter received 600 pounds of mixed sulphates of potash, soda, and magnesia, and also 392 pounds of super-phosphate, in the years 1844, 1848, and 1850.

Sixteen is not divided, but the first is the plot manured as stated for 1852–64, and the second is the same plot unmanured for 1865–71.

It is impossible to do justice to this valuable and instructive table, except by careful study and comparison; attention may, however, be called to the following points. (1.) The effect of single chemical manures on the crops. (2.) The effect of the three manures when applied two together. (3.) The effect of the manures when all three are used together. (4.) The comparative effects of ammonia salts and nitrate of soda. (5.) The comparative effects of sulphates of potash, soda, and magnesia. (6.) The continuance of good crops through the long period of thirty years, with the same manures and the same plots.

Experiments on the growth of oats, year after year on the same land; without manure, and with different kinds of manure.

Previous cropping—1847 and 1848, clover, experimental manures; 1849–1859, beans, experimental manures; 1860, fallow; 1861–2, wheat, unmanured; 1863, fallow; 1864, beans, dunged; 1865, wheat, unmanured; 1866, beans, unmanured; 1867–68, wheat, unmanured.

First experimental oat crop, 1869.

Area under experiment—¾ acre; each plot ⅛ acre.

Plots.	MANURES—per acre—per annum.						PRODUCE—per acre.													
	Ammonia Salts, (pounds.)	Super-phosphate, (pounds.)	Sulphate of Potash, (pounds.)	Sulphate of Soda, (pounds.)	Sulphate of Magnesia, (pounds.)	Nitrate of Soda, (pounds.)	1869.		1870.		1871.		1872.		1873.		Average for 69-73.	
							Grain, (bushels.)	Straw, (pounds.)	Grain, (bushels.)	Straw, (pounds.)	Grain, (bushels.)	Straw, (pounds.)	Grain, (bushels.)	Straw, (pounds.)	Grain, (bushels.)	Straw, (pounds.)	Grain, (bushels.)	Straw, (pounds.)
1	.....	.....	.....	.....	.....	.....	36⅝	2,156	16¼	1,022	20½	1,260	15	798	10¾	602	19⅞	1,162
2	.....	392	200	100	100	.....	45	2,744	19⅛	1,078	22	1,512	19½	1,162	17	966	24½	1,498
3	400	.....	.....	.....	.....	.....	56¼	4,130	30	1,932	57¼	4,550	55¾	3,430	36½	1,976	47	3,192
4	400	392	200	100	100	.....	75¼	6,048	55⅝	3,206	58⅝	5,600	62¾	5,054	48¼	3,094	59	4,606
5	.....	.....	.....	.....	.....	.....	550	62¼	4,788	36½	2,576	55	3,892	42⅛	2,310	39¾	1,848	47¼	3,080
6	.....	392	200	100	100	550	69¾	5,586	50	3,220	60¼	5,418	44⅝	2,688	63⅝	2,688	57½	3,920

MANURES.—*The Ammonia Salts* consist of equal parts of commercial sulphate and muriate of ammonia.

The Super-Phosphate was made with 200 pounds of bone-ash and 150 pounds of sulphuric acid, (sp. gr. 1.7.)

Nitrate of Soda—550 pounds of this salt was reckoned to contain the same amount of nitrogen as the 400 pounds of ammonia salts.

"*Experiments on the growth of beans, peas, and tares.*—Experiments on the growth of leguminous corn crops, with different descriptions of manure, were commenced in 1847, about nine acres being devoted to the purpose.

"Experiments with beans were continued for thirteen consecutive seasons, to 1859 inclusive; but during the later years the crop fell off very much, and the land became very foul.

"In 1860 the land was fallowed. In 1861 a crop of wheat, without manure, was taken. In 1862 beans were again sown, but with some variation in the manuring. In 1863 the land was fallowed. In 1864, '65, '66, '67, '68, and '69, beans have been grown, with much the same manure, on the same plots, each year, as in 1862.

"The general result of the experiments with beans has been, that mineral constituents added as manure, (more particularly potash,) increased the crop very much during the early year, and to a certain extent afterwards, whenever the season was favorable for the crop. Ammonia salts, on the other hand, produced very little effect; notwithstanding that a leguminious crop contains two, three, or more times as much nitrogen as a gramenaceous one grown under parallel circumstances. Nitrate of soda, however, has produced very striking

effects. But leguminous crops, grown too frequently on the same land, seem to be peculiarly subject to disease, which no combination of manuring that we have hitherto tried seems to obviate.

"Experiments with peas were soon abandoned, owing to the difficulty of keeping the land free from weeds, and an alternation of beans and wheat was substituted; the beans being manured much as in the experiments with the same crop above described.

"In alternating wheat with beans, the remarkable result has been obtained, that nearly as much wheat, and nearly as much nitrogen, were yielded in eight crops of wheat in alternation, with highly nitrogenous beans, as in sixteen crops of wheat grown consecutively, without manure, in another field, and also nearly as much as were obtained in a third field in eight crops alternating with bare fallow.

"Experiments with tares were also soon abandoned for the same reason; beans being at first substituted, with some variation in the description of the manures employed; but of late this experiment has likewise been abandoned."

"*Experiments on the growth of red clover.*

"Experiments on the growth of clover, with different descriptions of manure, were commenced in 1849, and with the occasional interposition of a corn crop, or fallow, have been continued up to the present time. As with beans, the result was, that mineral constituents, applied as manures, (particularly potash,) considerably increased the early crops; whereas, ammonia salts had little or no beneficial effect, and were sometimes injurious. It may be added, that even up to the present time, the beneficial effects of long previous applications of potash, are apparent wherever there is any growth at all. But since the first few years, all attempts to grow clover, year after year, on this land, have failed to give anything like a fair crop, or a plant that would stand the usual time on the ground, notwithstanding that fresh seed has been sown again and again.

"In 1864, a portion of the land was trenched two feet deep; one-third of the manure being applied at a depth of sixteen inches; one-third at the depth of eight inches, and the remainder on the surface; but the plant has died off as completely on these plots as elsewhere.

"The general result of the experiments is, that neither ammonia salts, nor nitrate of soda, nor organic matter rich in carbon as well as other constituents, nor mineral manures, nor a complex mixture, has availed to restore the clover yielding capabilities of the land.

"It is, however, worthy of remark, that, in 1854, red clover was sown in a kitchen garden, only a few hundred yards distant from the experimental field, on a soil which has been under ordinary garden cultivation for, probably, two or three centuries, and it has every year since shown very luxuriant growth; and after resowing four

times during the period, (in 1860, 1865, 1868, and 1871,) and a small cutting was taken in 1871, two cuttings in 1872, and two in 1873. This, therefore, is the twenty-first season of the growth of clover, year after year, on this plot of garden ground.

"Lastly, in the winter of 1867-8, small portions of the experimental land were dug, some to the depth of nine inches, some to the depth of eighteen inches, some to the depth of twenty-seven inches, and some to the depth of thirty-six inches, and sown to the respective depths with different manurial mixtures. From other similarly sized plots, the soil was removed to the depths of nine, eighteen, and twenty-seven inches, respectively, and replaced by soil from the same kitchen garden border, on a portion of which clover has been successfully grown since 1854, as above referred to. Clover was sown in April, 1868, over the whole of these, and some other portions not so treated; but the plant has, for the most part, died off during the winter following; and clover was again sown in 1869, but it died off during the winter.

"*Experiments with root crops.*

"Experiments with turnips were commenced in 1843. Eight acres, divided into numerous plots, were set apart for the purpose; and the crop was grown for ten consecutive years on the same land ('Norfolk Whites,' 1843–1848, and 'Swedes,' 1849–1852); on some plots without manure, and on others with different descriptions of manure. Barley was then grown for three consecutive seasons (1853–1855) without manure, in order to test the comparative corn-growing condition of the different plots, and also to equalize their condition, as far as possible, by the exhaustion of some of the most active and immediately available constituents supplied by the previous manuring. A new series of experiments with Swedes was then arranged, having regard to the character of the manures previously applied on the different plots, and to the results previously obtained. This second series was commenced in 1856, and continued for fifteen years, namely, to 1870, inclusive.

"It is impossible adequately to state the bearing of the results in a few words, but the following are some of the most characteristic indications:

"1. Without manure of any kind, the produce of roots was reduced in a few years to a few hundred weights per acre; but the diminutive plants (both root and leaf) contained a very unusually high per centage of nitrogen.

"2. Of mineral constituents, phosphoric acid (in the form of superphosphate of lime) was by far the most effective manure; but, when this manure is used alone, the immediately available nitrogen of the soil is rapidly exhausted.

"3. Really large crops of turnips can only be obtained when the soil supplies a liberal amount of both carbonaceous and nitrogenous matter (as well as mineral constituents); and when they are already available within the soil, or are supplied in the form of farm-yard manure, rape-cake, Peruvian guano, ammonia salts, &c., the rapidity of growth and the amount of the crops are greatly increased by the use of the super-phosphate of lime applied near to the seed."

These experiments of Mr. Lawes are very suggestive to inquiring farmers. In undertaking to follow them, it would be important to take into consideration the moisture, atmosphere, and cool climate in which they were made, and the differences which our dry air and hotter climate might produce in the results. But the main principles proved by them must be true in all places, however modifying agencies may affect their application.

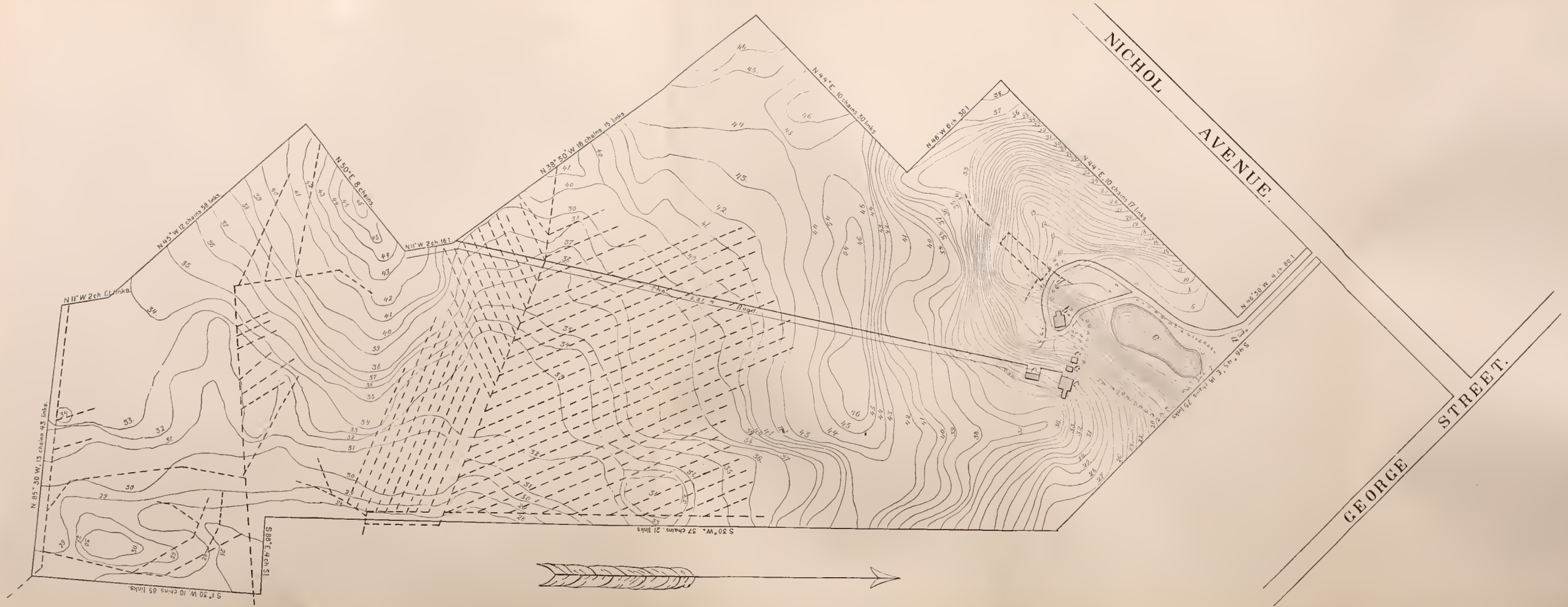
AGRICULTURAL COLLEGE FARM.

The farm of the New Jersey State Agricultural College is located partly in the limits of the city of New Brunswick, and partly in the township of North Brunswick. It is just a mile and a half from the front door of Rutgers College to the door of the farm dwelling. Its location is in the south part of New Brunswick, and near the city reservoir. The entrance to the farm is on the south side of Nichol avenue, and some seven hundred feet west of George street.

Its area is $97\frac{4}{10}$ acres, and it lies in an irregular plot, much longer than it is broad, the distance from the entrance to the extreme south end of the farm being a little more than a mile. The farm, when bought, contained $98\frac{4}{10}$ acres, but 6 acres were taken by a commission for the city water company, and 5 acres have been added by purchase.

The red shale, which is a strongly marked feature of the country about New Brunswick, underlies the whole farm, but deeply covered by earth, so that no shale is struck by the plow except in a single spot ten or fifteen rods square. The soil is a gravelly loam, light upon the ridges, but heavier on the flat grounds. All of it can be plowed and tilled for cultivated crops. The surface of the half nearest town is sufficiently uneven to afford good natural drainage: while the half farthest back is very flat, and portions of it were so wet as to be unfit for use until underdrained.

The farm is an old one and was probably opened about the year 1700. It was farmed in the usual way; that part naturally drained was kept under cultivation; a considerable portion, too wet for tillage, was cleared and used as permanent pasture ground, and a large plot at the back end of the farm, with many patches of wet ground in it, was still uncleared when bought by the trustees, though the wood had all been cut off. The land taken for the reservoir was from the best of the cultivated portion, and that added by purchase was


NICHOL AVENUE.
GEORGE STREET.
N 44° E. 10 chains 20 links
N 46° W 8 ch. 30 l
N 44° E. 10 chains 17 links
N 46° 30' W. 11 ch 80 l
N 38° 30' W 18 chains 15 links
N 50° E 8 chains
N 45° W 12 chains 58 links
N 11° W 2 ch 16 l
N 11° W 2ch 61 links
N 85° 30 W. 13 chains 43 links
S 1° 30 W. 10 chns 85 links.
S 88° E 4 ch 51
S 30° W. 37 chains. 21 links
Scale 1 inch = 4 Chains: or 1: 3168.

uncleared land, from which the wood had been cut off a few years before; so that our farm, when we began work upon it, contained forty-nine acres of tillable land, fifteen and four-tenths acres of pasture, and thirty-three acres uncleared.

The farm was purchased in the spring of 1864, but came under the direction of the college in the spring of 1865. The soil was very poor, having been subjected to an exhaustive system of tillage for years. The crop of wheat in 1864 averaged only six bushels an acre, the corn was very poor; the small area in grass yielded less than a ton per acre of weedy and unsaleable hay, and most of the land was entirely unproductive. The fences were down, and the lines on which they had stood were marked by wide hedge-rows of bushes and trees. The barns and out-buildings were old and out of repair, and the dwelling needed a new roof. The two advantages of the farm were, that it offered a good field for improvement by tillage, manuring, and drainage, and that it was so near the city and railroads as to be easily accessible to students and visitors.

Now, at the end of 1874, every acre of the farm not occupied by buildings and the pond has been plowed and cropped at least three times, all the stumps and roots from the thirty-three acres of uncleared land, and from several acres of old fence rows have been removed, seven miles of draining tile have been laid, and the buildings and fences put in passable though not in good order. The soil has been enriched and cultivated and good crops have been obtained.

The value of produce sold from the farm has increased from year to year, being now something more than $4,000 per annum.

The expenses have been large, much larger than the receipts from the farm and from donations. They might have been less by pursuing the improvements more slowly; but it was known that the friends of agricultural improvement were looking earnestly for results from experiments on the farm of the State Agricultural College, and it was also known that experiments which are worth anything must be made at much extra cost for intelligent labor, constant watching and great consumption of time in measuring, weighing, recording, computing, &c., and that many of the experiments, though instructive, yield no money returns. Believing then, that the objects of the Agricultural College Farm would be best promoted by bringing it into use in the shortest possible time, its improvement has been pushed forward as fast as means could be raised for the purpose. And we now present this account of the farm, its present condition, the experience gained in its cultivation, in its drainage, and in clearing it of stumps; the effects of fertilizers on different crops, and the conclusions from experiments with different fertilizers on the same crop, and proposals for future and more varied series of experiments.

Grubbing, and pulling out roots and stumps.—The first attempt at taking out stumps was by digging around, cutting off the roots and

then prying them out. This, however, was found to be too slow and expensive for so large a job. It was very little better than the old way of plowing around the stumps and cutting off the sprouts until they were dead, and then leaving them until the smaller roots had rotted away, and they became so much loosened as to be drawn out without digging or cutting. In ordinary cases this old way is probably the most economical and manageable. We next tried the Buckeye stump-puller. It was worked by horse-power, and was intended to do its work rapidly, but it was not sufficiently powerful to pull the large chestnut or white-oak stumps which were in our ground, and after much trial we had to give up this machine, though it works rapidly on small stumps. There were on the farm hundreds of chestnut stumps, still alive, from which the original growth had been cut off, perhaps a hundred years ago, a second growth had sprouted up around the original one, and from three to six trees had grown on this old stump for fifty or sixty years and then been cut off; a third growth had in the same way come up around the second and after standing twenty-five or thirty years had been cut off; and then a fourth set of sprouts had grown for ten or fifteen years before the clearing began. Clusters of stumps all in one mass in this way were extremely difficult to pull up and remove from the fields. The Pioneer stump-puller, made by G. W. Pressey, of Hammonton, was tried at last, and it answered the purpose admirably. This machine can be carried by two men, it works by powerful hand levers, and is successfully managed by laborers of ordinary skill and intelligence. It did the work required at less expense than was done in any other way tried on the farm. The expense of pulling, hauling together, and burning the stumps, and then of smoothing over the holes left, and making a soil over the subsoil brought to the surface, is so large that it will not be repaid on ordinary farm lands, remote from markets. Under the peculiar circumstances of the college farm, it was probably the best course to pursue.

Drains and Drainage.—The accompanying map has the location of the land-drains marked by dotted lines. The fine curved lines drawn on the map are called *contour lines*, and represent lines drawn on the surface of the ground, so as to show what parts of the farm are on the same level. They are all marked by small figures, which indicate the height of the line above the surface of the water in the pond. For example, the contour line marked 46, near the reservoir, and also in a closed curve towards the east, shows where the surface of the ground is forty-six feet above the pond; and the lines marked 28, at the southeast part of the map, shows those parts of the surface of the ground which are twenty-eight feet above the water in the pond. It is desirable to locate drains so that they may have the greatest possible descent, and so carry the surplus water off in the shortest time. These

contour lines give the information necessary for laying out such a system of drains, as the lines which run square across these contour lines are the lines along which there is the greatest fall or descent.

The northernmost main drain has a six-inch pipe tile in it, and the branches are mainly two-inch pipe tile. The descent in all these, it will be seen, is not less than one foot in one hundred feet distance, and in most of them it is considerably more. There has been no failure in this system of drains; it has carried off the water as fast as desired. The two other main drains in the back part of the farm are laid with four-inch pipe tile—the laterals are mostly of two-inch pipe tile, there being a few three-inch tile in the middle set of drains, and a few inch-and-a-half pipe tile at the extreme west end of the middle set. The descent in these is very little, if any more than one foot in two hundred feet of distance, both in the mains and the laterals. These drains work well, but after heavy falls of rain they cannot carry off the water quick enough, the fall being insufficient to give proper velocity to the running water. We suffered much damage from this cause, in the summer of 1873, the crops of potatoes, carrots, and cabbage being almost destroyed by the water standing on them too long. The land is thoroughly drained at last, but not quick enough. The extreme flatness of the ground makes the case a difficult one. It is now in good grass, and we shall leave it for meadow, as long as it yields fair crops; and when it needs to be plowed again, a second four-inch tile must be put down in each main drain, or else a large and deep open ditch must be cut through the lowest part of the field, and the underdrains run into it.

The tile used is round pipe, and the pieces which are either one foot or two feet long are, when laid in the ditches, held accurately end to end by means of rings or short sections of larger pipe, into which the ends of the two pipes to be joined are entered till they come in contact. In this way neither of the pipes can settle down or aside from the other, though the rings are loose enough to allow water to enter at the joinings as fast as it can run off. There have been no failures with these tile during the six or seven years which some of them have been tried. They cost about one-half more than horse-shoe tile, but as the expense of the ditches is the same for both, and the pipe tile, from their shape, are less liable to become clogged, and, on account of their rings, cannot get out of line, we consider them to be the most permanent and economical. The distance of the ditches apart is from thirty to forty feet, according to the condition of the ground, and the expense it is thought necessary to incur. Those forty feet apart, have answered their purpose well in all the north set of drains. The depth of the ditches has been from two and a-half to three feet, varying, of course, with the inequalities of the surface, so as to keep the bottom of a uniform slope. This depth has been quite sufficient for the purpose of drainage and cultivation of the soil, thus

far, and the subsoil is so close that we are in many places obliged to loosen it with a subsoil plow before it will allow the rain-water to sink down into and through it to the drains. But this difficulty is gradually disappearing, and the drains are doing their work well.

The benefits of drainage are plainly seen by every one who visits the farm; it has made that half which was formerly not worth clearing or cultivating into tillable and productive land. It has dried all the ponds, sloughs, and springy grounds, so that there are no blanks, balks, or waste spots to interfere with cultivation and to waste labor. It drains off the water and dries the land so quickly, that what was swamp land is now soonest ready for tilling after a rain. The draining and drying of the ground diminishes the loss of time from wet weather, and causes the crops upon it to become less injured by protracted droughts.

Experiments with fertilizers.—Many experiments with fertilizers have been tried, some of which have been very satisfactory, but many have afforded no reliable conclusions. Experiments made on very poor land have failed so frequently, that we cannot avoid the conclusion, that land must be in fair condition for producing crops before the experiments can properly be begun; for on poor ground rain, dry weather, or other accidents of the season will affect the crop much more than the fertilizer will. The crop on good soil may be injured as much as the whole crop on poor ground is worth, and still leave a paying balance. It is impossible, too, to bring land in poor condition into proper tilth in a single season, however much manure may be put upon it, or however thoroughly the soil may be pulverized and mixed.

Experiments on the growth of Indian corn. 1872.—A plot of ground about one and a quarter acres was used for the experiments. It is a rather heavy soil, with many small stones in it, underlaid at the depth of three or four feet by red shale; and the soil is from the disintegrated substance of that rock, mixed with lighter colored sand and gravel. It has been very stubborn and poor, but has been cultivated from year to year, and lightly manured. Last year it had on it a moderate crop of mangold-wurzels, and this spring it was manured evenly and lightly with barnyard manure, plowed and planted with corn. The rows were four feet apart, and the corn was planted in drills, two stalks being finally left every sixteen inches. For convenience in cutting and putting in shocks, six rows together were manured with the same fertilizer, except the thirty-seventh and last row, which was an odd one, and manured alone. It was planted the 19th of May, and the fertilizers put on the surface of the hill of corn the same day.

The field was all cultivated in the same way, and the crops of corn and stalks harvested alike, and the grain as well as the stalks weighed.

The corn all started quickly and looked vigorous and thrifty throughout the season. The muriate of potash evidently hurt the

growth of that to which it was applied, some of the plants on which it was put, wilted and died within the first two or three weeks. This fertilizer should have been sprinkled along in the drill, or else sown broadcast over the whole ground. The sulphate of ammonia also caused some injury to the growing corn. Aside from this, I was not able to see any difference in the growth of the stalks, nor was there any decided difference in the time of ripening. The corn was cut up and put in shocks at the end of September, and the last of it was husked on the 31st of October, the stalks weighed the 4th of November. There was no soft or unripened corn. Short ears and nubbins were most abundant on the plots where the crop proves to have been the lightest. The corn was weighed, and seventy pounds allowed for a bushel.

No. of plot.	Manure per acre in pounds.	Shelled corn per acre.		Stalks per acre.
		Pounds.	Bushels.	Pounds.
1	250 Plaster	5804	82	5978
2	Nothing	5505	79	6000
3	500 Super-phosphate of lime	5118	73	6061
4	250 Muriate of potash	5532	79	7104
5	250 Sulphate of ammonia	5918	85	4638
6	375 Am. super-phosphate of lime	6441	92	6057
7	360 Dried blood	7083	101	5833

1873.—The experiments of 1872 suggest several interesting inquiries, but of these only that on the fourth plot, upon which muriate of potash was applied, was pursued further. That is remarkable for the large increase in the weight of the stalks, beyond that on any of the other plots. Assuming that this result was correct, it was of interest to know whether the effect observed was caused by the potash, or by chlorine with which it was combined; for if it were the potash alone, then sulphate or carbonate of potash could be used to replace the chloride of potassium, *muriate of potash;* while if it were caused by the chlorine, the chloride of sodium, (*common salt,*) could profitably be used instead of chloride of potassium. To pursue this inquiry further, the experiments given below were made. The ground selected was a sandy loam, and had been in beets last year. It was not manured this season. The plots were about one-third of an acre each, and six were used. The corn was planted in rows four feet apart, and the single grains put about a foot apart in the rows. The

fertilizers were applied on the hills soon after the corn was covered with earth, three hundred pounds per acre of each were used. The corn grew fairly and the following is the result of the trial.

FERTILIZERS USED.	Bushels of Corn per acre.	Pounds of Stalks per acre.
Chloride of sodium, *common salt*	56.9	4174
Sulphate of soda, *Glauber's salts*	63.1	4210
Chloride of potassium, *muriate of potash*	58.7	4646
Sulphate of potash	56.8	3817
Nothing	63.9	3945
Blood guano	62.3	4205

The stalks grown where chloride of potassium was applied were decidedly heavier than those grown where the other salts were used.

1874.—The experiments with chloride of potassium upon Indian corn made in 1872 and 1873, were repeated this year. Twelve rows of corn were planted on a plot of unmanured ground of uniform quality, which measured eighty one-hundredths of an acre. After the corn was fairly up, six of the rows were dressed with chloride of potassium at the rate of one hundred pounds to the acre; the fertilizer being put directly on the hill. The other six rows were left without any manure. The chloride of potassium made the young corn wilt a little, and a few spears were killed; but most of it soon recovered and grew well. The stalks where the salt of potash was applied, have kept their green color best, during the whole season. The following are the weights of the ears of corn and the stalks, in pounds:

	Corn.	Stalks.
That manured with chloride of potassium	1711	1420
That unmanured	1440	1232

The numbers showing the yield per acre in pounds, are inserted in the accompanying table, together with the amount of the crops per acre for the two preceding years, and the weight of the fertilizer used in pounds.

Years.	1872.	1873.	1874.
Corn in the ear, with muriate of potash	5532	4109	4563
Corn in the ear, without " "	5505	4473	3840
Stalks, with muriate of potash	7104	4646	3787
Stalks, without " "	6000	3945	3312
Per centage of gain in weight of stalks	18	18	15
Chloride of potassium, (muriate of potash)	250	300	100

The experiment in 1872 showed no gain in corn, but a gain of

eighteen per cent. in the weight of stalks. That of 1873 showed a l ss in the corn, but a gain of eighteen per cent. in the weight of stalks. The experiment of this year shows a gain of fifteen per cent. in the weight of the stalks, and of nearly the same amount in the corn. The crop of this year was grown in part on raw ground, and part on sod. That on raw ground was much damaged in the roots, but that manured with chloride of potassium suffered much less than that which was left unmanured. The extreme dry weather of the latter part of the season shortened the corn crop greatly.

These experiments tend to prove that chloride of potassium has a specific influence on the growth of *corn stalks*, and but little, if any, on the growth of the grain. It was accidental that the experiment with this fertilizer was first made upon Indian corn. A trial made for a different purpose, indicated that a marked effect was produced by it upon stalks, and this led to further trials for verifying or disproving the first result. This having now been done for two years in succession, and the results according with those of the first experiment, we shall now extend them to other graminaceous crops, in which the straw or hay is of more value than corn stalks. An experiment upon hay was begun this year, but the accuracy of the result was destroyed by a workman, and one upon potatoes was not satisfactory on account of the drouth.

From these experiments it may safely be inferred that—

1. Chloride of potassium has a specific influence on the growth of the stalks of Indian corn, increasing their weight materially, while it does not appear to affect the growth of the grain.

2. Chloride of sodium, sulphate of soda, or sulphate of potassium, the other cheap alkaline salts, do not appear to have the same effect.

3. The pure super-phosphate of lime did not increase either stalks or grain.

4. The sulphate of ammonia increased the amount of corn, but the stalks were decidedly lighter than where no fertilizer was used. This result must be verified or disproved.

5. The best crop was got where dried blood was used, and the next where an ammoniated super-phosphate was applied. This result is in accordance with the experience of many farmers. And in future experiments, to ascertain the best manure for corn, a mixture of sulphate of ammonia, super-phosphate of lime, and muriate of potash will be made, using for a first trial 200 pounds each of the first and second, and 100 pounds of the third, per acre.

Experiments in Growing Wheat.—In 1871, wheat was raised on six acres of ground that had been manured two years in succession, first for mangold wurzels, and last for potatoes. The wheat followed the potatoes, without manure, and the crop was 33 bushels an acre. In 1872 wheat was grown on 12¾ acres of new ground, on which a single crop of corn and oats only had preceded it.

The ground was manured, a part with super-phosphate of lime, 400 pounds per acre; part with bone dust, 400 pounds per acre, and a little with barnyard manure. The crop was 15 4-10 bushels per acre. The ground was poor and the winter severe, but the chief cause of the small crop was the injurious effect of the oats on the soil.

Of the wheat crop of 1873, 2 acres were grown on a poor clover sod, mown in June, plowed in August, and again in September, and manured with 400 pounds super-phosphate of lime to the acre. The yield of wheat was 35 bushels per acre; 7 acres were grown on potato ground that had been well manured with a compost of hair, marl and manure; no manure was put on with the wheat; 8 acres were grown after oats, and manured with the compost of hair, marl and manure. The wheat on the 15 acres was harvested together, and the yield was 20 bushels to the acre. The potato ground was rather the best soil of the three plots, and the compost cost quite as much per acre as the super-phosphate. The hair is an ammonical manure, and is not so well adapted for growing wheat on our soil as the rich super-phosphates which have a little ammonia in them. On still another field of wheat, of which the soil was in moderate tilth, 300 pounds per acre of nitrate of soda was applied, and the crop was only 12 bushels an acre. The preceding crop was oats; a more suitable manure would have been 300 pounds of super-phosphate of lime in place of half the nitrate of soda.

The wheat crop of 1874 was grown on $2\frac{3}{4}$ acres of rich ground, that had bean manured and a crop of potatoes taken off it, and on 10 acres of new and flat ground, part of which had been in oats and part in potatoes, carrots and cabbage, and been manured with hair compost. The smaller plot yielded 36 bushels per acre. The other is not yet threshed, but it will not yield half as much per acre as the other.

From all the experience on the farm thus far, the best crops of wheat have been grown where super-phosphates have been used; and we are following up the practice this year; now the young wheat looks remarkably healthy and strong. For a crop to precede the wheat, potatoes have been the least injurious. It should be observed that the crops of hay following the wheat manured with hair compost, or with nitrate of soda, are quite as good as those following that manured with super-phosphate.

Experiments with rye have been made on a small scale, growing it on very rich ground, to be used for green fodder if needed; 47 bushels of grain and 3 tons of straw per acre were raised in 1873. In 1874 the crop was 25 bushels per acre, and the straw much lighter than in 1873, but in both cases this very common crop was grown profitably.

Experiments with oats have not been satisfactory and they will here-

after be conducted on a smaller scale and with more caution in preparing and manuring the ground.

Experiments with potatoes have been varied and not very successful. Some crops of 200 bushels an acre have been raised, but generally they have not amounted to half that quantity. Manures have been varied in almost every way we could think of, but with no success. Some variation in tillage must next be tried. The difficulty of course is in the soil, but the crop is too important on every farm to be given up without the most persevering efforts for its profitable culture.

Carrots have been grown on the farm every year to supply a demand for them from towns people who feed them to horses. They require rich ground, heavily manured with barnyard manure, and a great deal of labor to keep them free of weeds. The crop varies from three hundred to six hundred bushels an acre, and is profitable. Much skill is required to grow carrots well. The young plants are wonderfully weak and tender, and so many die in breaking through the ground or from the hot sunshine, that it is almost impossible to get a uniform and thick stand of the plants.

Mangold wurzels are grown for cattle feed. They keep better than any other root crop, not being liable to rot and remaining as sound through May and June as they were in October. Our crops vary from four hundred to eight hundred bushels an acre; they are much easier to raise than carrots, the young plants being larger and stronger and their early growth more rapid. They thrive best in a deep and rich soil, and barnyard manure and salt are the best fertilizers for them. Twenty or thirty loads of manure to the acre can profitably be put on soil for them, and six bushels of salt may safely be used.

Turnips, both common and Swedish, are grown. They make excellent feed for cattle, but are of extremely uncertain sale in market. They require both manure and super-phosphate to make them grow to the best advantage.

Cabbage is grown as a market crop, and in favorable seasons is profitable; but for the last two years the crop has been almost spoiled; the first year by heavy rains, and the last by a protracted drought. On rich ground or with heavy manuring the crop of cabbage is a very large one and may be grown profitably even for cattle fodder. Some farmers are of the opinion that it yields more green food for animals than turnips or beets do, and our experience favors this; but there are difficulties in keeping cabbage which must be met before it can be substituted for roots. The best crops of cabbage have been grown on ground enriched with barnyard manure and hair compost.

Hay.—No other crop is grown on the farm to which it seems so well adapted as hay. This year we took into the barns ninety large loads from thirty acres of meadow. And there is less difficulty in getting a good crop of hay than with any other crop we have tried.

The best crops have been grown after wheat, and no manure has been found necessary for two or three years after the ground has been put in good condition for wheat.

Stock.—In addition to the teams of horses and mules a stock of milk cows is kept on the farm to consume the coarse fodder. Ayrshire cattle have been tried and are giving satisfaction for their good milking qualities. Short-horns have also been tried; they have not proved as good milkers as the Ayrshires, though they are much larger and their calves are so much heavier as to make them worth much more to the butcher. The short-horns were imported and have not proved as hardy as the Ayrshires, which have been in the vicinity for three or four generations; and this must be considered in any comparisons that are made. The cows raised on the farm are now the best milkers we have. Native cattle have also been kept, and some of them have been quite equal to the Ayrshires, but many have not proved so good. Grade cows have been quite as good as the full-blooded, but of course they are not valuable for perpetuating the stock.

Where the production of milk for market is the object, the quality and amount of feed given is quite as important as the breed of cattle, though it necessarily comes second in order. We have made many trials with different kinds of feed, and in soiling, but with the changes attendant on the improvement of the land we have not been able to carry them out steadily and carefully enough to make them decisive.

Up to this time the experiments on the farm have been tentative; made rather to see what could and what ought to be done to benefit agriculture. And many results have been reached which may be useful to farmers, and which can give direction and point to the experiments that should now be planned and set in permanent operation to settle the questions about the cheapest production of manures and fertilizers, the effect of different fertilizers on the various farm crops, on the best modes of tillage for different soils and crops, on the feeding and rearing of stock, on the comparative merits of different breeds of cattle, sheep, and swine, &c.

(1.) Draining Tile Manufacturers.

(2.) Manufacturers of Agricultural Implements.

The subjects of Land-Drainage and of Agricultural Implements are of so much importance, that it was thought best to attempt to collect some statistics in regard to the manufacture of drain tile and of implements, and questions upon these subjects were sent out to the different societies in the State. The answers received are given below, but it is probable they give but an incomplete account—and, in any case, our manufacturers make large sales in the adjoining States, and our

farmers make many of their purchases in New York, Pennsylvania, and Delaware.

J. T. Kern, Belvidere: (1.) "We have no manufacturers of draining tile, that I am aware of, in this county. (2.) We have several manufacturers of agricultural implements in this county—at Phillipsburg, Belvidere, Hackettstown, and Washington."

Dennis C. Crane, Union county: (1.) "We have no land drain tile factory in this county. There are three that manufacture stone and earthenware and glazed pipe, viz.: S. H. & S. Leonard, Rahway; J. M. Pruden, Elizabeth; Charles Forsyth, Elizabeth. (2.) No manufacturers of agricultural implements, to my knowledge."

William S. Potter, Somerville: (1.) "E. E. Brown, of Somerville, makes brick and tile, and of the latter, from 50,000 to 75,000, (common horse-shoe tile, varying from two to six inches.) (2.) Screw mower and reaper manufactory at Raritan. Kenyon & Brother, the same, with the addition of power sausage-cutting machine."

F. S. Holcombe, Hunterdon county: (1.) "Abraham M. Fulper, at Flemington, tile manufacturer, principally horse-shoe tile; price of ordinary, $18 to $20 per 1,000. (2.) Deats & Case, Pittstown, manufacture all kinds of agricultural implements; also, stoves and castings."

Henry E. Hale, Princeton: (1.) "Draining tile of the horse-shoe pattern are made at Blawenburg, Somerset county, by Mr. Stryker; price, $14 per 1,000, 3-inch; $20 per 1,000, 4-inch; $30 per 1,000, 5-inch. George Anderson, Ewingville, Mercer county, manufactures tile—styles and prices not learned. (2.) A two-horse machine for cultivating corn, called the 'Riggs Plow,' is made at Hightstown, Mercer county. At Trenton there are two large factories for making agricultural machinery."

Henry K. How, New Brunswick: (1.) "James Schureman's tile factory, near Hamilton avenue and Somerset avenue, New Brunswick. Hartwick's tile factory, on the New Brunswick and Trenton turnpike, near the Sand Hills, in South Brunswick township. C. W. Boynton & Co., of Woodbridge, manufacture drain tile in very large quantities, and of all sizes. They make mostly pipe-tile with collars, and they supply a large market outside the bounds of the State. (2.) There are no agricultural implement manufacturers, although the Ten Eyck plow is made by Mr. A. Ten Eyck, of New Brunswick, and there are several wheelwrights who make horse-rakes."

S. E. Thompson, Freehold, Monmouth county, writes: (1.) "Dunn, Dunlap & Co., at Matawan; Donahue, at Jerseyville; Brocklebank, at Pigeon Swamp, and others near Matawan, make drain tile. Prices range from $15 to $40, according to size. (2.) Combs & Bawden, at Freehold, do all kinds of casting for tools and machinery. Farming implements, such as wind-mills, gang-plows, potato-diggers, &c., are made at several places in the county."

H. J. Budd, Mount Holly, furnishes the following statistics and prices of draining tile and list of agricultural implement manufacturers:

1. "Christopher Rigg & Son, P. O., Burlington, manufactures about 80,000 of 3 in. open tile, price $16; 30,000 4 in. open tile, price $24; 8,000 6 in. open tile, price $50.

"John Braislin, Crosswicks, manufactures about 200,000 of 3, 4, and 6 in. open or horse-shoe tile, price $16, $26, $50, $55, and $60. Pipe or sole tile made to order.

"C. G. Kinsley, Columbus, manufactures 300,000 per annum of 3, 4, and 6 in. open tile, price $16, $24, and $50.

"W. A. Scattergood & Son, Rancocas, manufacture 3, 4, and 6 in. open tile, price $16, $24, $50.

"I could not get the number manufactured from the last two, but suppose, from what I have seen of their yards and sales, each amounts to about the same as C. Rigg & Son. Not much demand for sole tile, consequently but few manufactured.

2. "Theodore H. Risdon & Co., Mount Holly, manufactures the Warren Iron Plow.

"Thomas Alcott & Son, Mount Holly, manufactures the Empire Iron Plow and Howland Feed Mill.

"John Brock, Moorestown, manufactures the Empire Iron Plow."

Mark H. Busby, Masonville, Burlington county, furnishes, in addition to the above list of Mr. Budd:

"Smith, at Smithville, manufacturer of agricultural implements."

Joseph Carter, Woodbury, Gloucester county writes: (1.) "We have two manufacturers of draining tile in this vicinity. James C. Dobbs, 'West Jersey Tile Works,' near Mantua, wrote me that he had made near 200,000 this year, (1874,) one fourth *sole,* and the balance *open* tile. His price list per thousand, at the yard, or delivered on the cars, net, is:

3 inch open tile	$18 00
4 " "	27 00
5 " "	40 00
7 " "	60 00
2 inch sole tile	15 00
2½ " "	18 00
3 " "	21 00
4 " "	36 00
5 " "	52 00

A discount of $2 per 1,000 for cash on delivery or within thirty days. P. O. address, Gloucester City, N. J."

"Benjamin S. Thakara, at Woodbury, says, (1.) he made 100,000 tile this year, (1874,) mostly open tile. His prices are about the same as those of Dobbs. (2.) "We have not any manufacturers of farm

implements in our county, except a number of good wheelwrights, who make wagons, carts, plows, cultivators, harrows, &c., &c."

David Petit, of Salem: (1.) "One manufacturer of draining tile, Aaron W. Haines, Yorktown. (2.) We have no manufacturers of agricultural implements further than our mechanics and machinists generally, who put up agricultural implements and repair them when applied to."

J. Morgan Barnes, of Woodstown, sends the following names and addresses of draining tile manufacturers, viz.: N. Y. Lippincott, Auburn, Salem county. Taylor & Conover, Woodstown, Salem county. John Haines, Woodstown, agricultural implements.

F. S. Regensburg, Egg Harbor City, writes: (1.) "Draining tile are manufactured by a pottery in this city; the kind are inferior and but a small number are made. (2.) No agricultural implement manufacturers.

PUBLIC ROADS, AND THEIR IMPROVEMENT.

There is a want felt throughout our whole State for better roads, and a conviction that the old method of making and repairing roads by personal service is expensive and inadequate to accomplish its object properly. The old laws require that the road to be worked be divided into small districts, each under an overseer, to whom is committed the whole planning and direction of the work to be done, and who is not guided or restrained by any plans which may be for the interests of other districts, or for the best interests of his own district in years to come; and, on the other hand, it is felt by overseers of roads, in many cases, that the roads they have to repair are mainly used and worn out by persons who pay nothing towards the expense of repairing them. The importance of having good roads is appreciated by all, but it is not easy to devise any detailed plan which will suit the circumstances of the thinly settled portions of the State and of those which are densely populated and highly improved; or which shall provide for the accommodation of the traveller and protect the tax-payers in their rights. Much has to be learned by experience, and probably we shall only reach the ends we aim at by repeated attempts and partial successes.

In Essex county, the matters pertaining to roads have been put in charge of the Essex Public Road Board, with ample powers to plan for the whole county, and to execute such works as they judge for the interest of the public. The law was approved March 31, 1869, and under it avenues and roads have been laid out, graded and macadamized, and excellent roads have been made. The expenses have been very heavy, but property has been increased in value and business has been so facilitated that, it is the general impression, that the benefits have already far exceeded the cost.

The people of Monmouth county have made great improvements in their means of communication, by building good turnpikes and collecting toll from those who use them. Their experience is well given in the letters here presented.

Hon. John W. Herbert, of Marlborough, writes:

DEAR SIR:—In reply to your inquiries, permit me to make the following statements:

Number of turnpikes and length.—There are in Monmouth county fourteen turnpike companies, having about one hundred miles of road.

How built.—Turnpikes ought to be well rounded, sufficient to carry off the water, and graded to at least not more than one foot rise in forty feet, then well graveled. The gravel must have sufficient clay or adhesive matter in it to pack well. In long descents there ought to be breaks, to turn the water off, or in the spring of the year, when the gravel is soft and ruts are made, heavy rains will gutter the road and wash off large quantities of the gravel.

Cost of building per mile, and expenses of keeping in order.—That depends upon the amount of grading, and how well it is done, and how far gravel has to be hauled; but I suppose $2,000 per mile is not far from the average cost in our county.

Turnpikes built at the present day cost more than they formerly did, because they are graded better, as it has been proved by experience that it is economy to make easy grades, because it does not cost more than half to keep a level, or nearly level, road graveled and repaired that it does a hill-side, that rises, say, one foot in twenty feet. The cost of keeping the Key Port and Freehold turnpike in repair, per mile a year on the level parts, is about $150 per mile, and about double that amount on hill sides. When the gravel wears out, and becomes loose or sandy, it has to be removed and regraveled; say, about once in two years. The best material for making turnpikes on sandy soil is oyster shells, lightly covered with sand gravel. A road made out of these materials will be equal to the best macadamized roads, all seasons of the year. Oyster shells on clay soil, or mixed with clay gravel, do not answer a good purpose. Of course, they cannot be advantageously used far from the shore.

Success, financially.—Our turnpikes have not been a financial success, nor were they expected to be. Capitalists have invested but very little in them, being built principally by farmers and property-holders near the road, for the purpose of securing good roads, or an increase to the value of their property. The average dividend is about 3 to 4 per cent. annually. Of course, some have been more successful than others, owing to the amount of business or the management of the company.

Could such roads be built by the public? Certainly the public

could build them, but they would cost perhaps from twenty-five to fifty per cent. more. Men seldom do as much for the public as they are obliged to do for companies. The great difficulty of the public has always been in keeping them in repair—neglecting to scrape, and turn the water, and gravel when it ought to be done. Failing to give that attention an interested superintendent gives, whose duty it is to go over the road daily.

Would the graveling of all the roads be practicable? There are two very important reasons why it is not practicable—

1st. The great distance good gravel is from some parts of the roads, would make it too expensive. If gravel has to be carted over five miles, and many roads are further off than that, and you only put a yard of gravel to three feet, the cost of only graveling would be over $3,000 per mile.

2d. Many highways are but very little traveled, especially those in sparsely settled or barren districts, and some roads are only traveled by a few. It would in these cases be too expensive for any township, and it would be found impracticable, if not impossible, to gravel all the roads.

What is the amount of the increase in the valuation of farm lands per acre? This is difficult to answer; that there has been considerable increase is well-known, but how much, would be merely guess work. I know a team takes about fifty per cent. per load more on turnpikes than they did on the old highways. That would make two teams equal to three, or in other words, it brings every farm one-third nearer to market.

What suggestions in regard to the road laws? I have no suggestion in regard to the present road laws; only in regard to the present expensive system of building small bridges by the county; say a bridge is needed over a small stream, first three freeholders are warned out; they meet and conclude to build the bridge; and advertise for proposals; and meet again to receive bids or proposals. When the bridge is finished they meet again; perhaps the bridge is not accepted, and they are obliged to meet again; here you will see the expenses of the freeholders, for four meetings, (not computing mileage,) is $24, including mileage, perhaps $40. Yet pipes could be used in many of these streams, and the cost would be less than what it cost for the freeholders attendance alone. That this is wrong is apparent, but how is it to be altered. At present every township seems to think it a great saving to have the county build every little bridge; and every freeholder tries to get every little stream bridged by the county, thinking he has done his constituents a service.

While the fact is, it costs the people twice as much to build small bridges by the county as by the township. If every bridge that could be built with one bent, was required by law to be built by the township, it would save the people of our county, at least, $10,000 per annum.

Marlborough, February 3d, 1875.

J. F. T. Forman, Esq., of Freehold, writes:

Dear Sir:—Yours, making inquiries regarding roads is received. I will endeavor to give you such general information as I possess, without going much into detail; and as your inquiries are of the turnpikes leading out of Freehold, the first I would name, being the oldest and longest, is the one leading to Keyport, thirteen miles in length, the cost of which I cannot give, as it was changed from the Monmouth County Plank Road to a turnpike, which necessitated a debt of perhaps $20,000, which, with the expenses of the alteration, caused it to start under embarrassing circumstances. It has, however, been paying for many years a dividend of three per cent. yearly, and laying by a sinking fund for the purpose of ultimately paying off the debt. This road is of immense value to a very large number of farmers around Freehold and Marlborough, and, owing to the almost continual travel, must, ere long, become a paying road. It has been in operation about twenty years. The next I would name, and perhaps second in importance, and with which I am more familiar, is the Freehold and Colts Neck Turnpike, five and a-half miles long, constructed in 1859, at a cost of $8,750.

As you ask the manner of building these roads, I will state the method pursued here, and think it has been generally adopted by all roads with which I am acquainted. First, thoroughly drain all wet grounds, and put in good and sufficient culverts, made by arches of brick, or side walls of stone, covered with flagging; then grade to the desired level, keeping the centre of the road sufficiently high to prevent water from standing thereon; then cover to the width of twenty feet and ten inches thick with good gravel—it is not important that the outer part of the gravel be more than five inches thick. You will then have a good road, and, by proper attention, will remain so a length of time, with the application of a few loads of gravel and very frequent scraping.

There are five other turnpikes running out of Freehold to different parts of the county: one leading to Englishtown, about four miles in length, costing about $6,000, but owing to small amount of travel, is not flourishing financially. Another, the Manalapanville, which may be ranked among the first in its construction, but like the last, is yielding a poor return for the investment—much of which is due to want of economy in construction and insufficient travel. Length, five miles; cost, $8,000.

Another, the Smithville, four miles in length, cost $6,000, and is paying four per cent., and kept in good condition. And still another, the Blue Ball, four miles in length, costing $9,000, leading south, toward Squan. This may be considered one of our most useful roads, having been built over a road almost impassable three months in the year. This, as in the case of the Keyport, was built on the ruins of a plank road, consequently involving them with a debt of $9,000,

which, I am happy to say, they have paid, and are now paying four per cent. on their capital. There is still another, leading southeast to Jerseyville, which has done much more to enhance the value of their farms than that of their purses. Three miles long ; cost, $4,000.

I do not estimate the value of the roads by the dividends they pay, but consider the value of the farms through which they pass so much enhanced, and the satisfaction of riding on a good road far overbalancing all pecuniary interests, and think the land-owners, who are the principal stockholders, would feel fully compensated, did they not receive one dollar in dividends. I would here state, that the cost of building our roads and keeping them in repair, is largely due to the scarcity of gravel, costing from forty cents to fifty cents a load delivered. I think the public would suffer much inconvenience by having the turnpikes taken from the present ownership.

I am not sufficiently acquainted with the general road law to suggest any alteration. As regards the practicability of turnpiking any road, there may be exceptions, but by an adherence to the plan proposed in the former part of this letter, I know no reason why it cannot be done, but would always recommend (especially if the soil be wet) to have the road three rods wide.

I have endeavored to give you my little experience and knowledge in regard to turnpike roads, without vouching for their entire accuracy, but think they approximate the facts so near that you can form your opinion thereof; and if by so doing I have contributed in any manner to the information sought, you have it cheerfully.

Very respectfully, yours,
J. F. T. Forman.

Freehold, Jan. 28th, 1875.

Hon. George C. Murray, Middletown, writes :

Dear sir—Have just received yours of 1st inst. In so rapid a communication as this must be, you will please remember that statements of numbers, or references to statutes, must be only approximations. I have not time for verification.

In Middletown township there are about one hundred (100) miles of roads, divided into about fifteen (15) road districts. The sum raised yearly for working them is about fifteen hundred ($1,500) dollars or fifteen ($15) dollars per mile. The comparison of these numbers, one mile and fifteen dollars, explains at once, that, aside from turnpikes, we can have no civilized road.

About fifteen years ago, we had a law passed, enabling any road district to raise by tax an additional sum, equal to its share of the general amount voted at the annual town meeting. I am not aware, that more than two districts have taken advantage of this law. In one, there is so much bad road over salt meadows, that the roads are

no better than the general average; in the other they have only made use of the law during the present year.

About eight years ago I was on a committee to devise some plan for working the roads. We had a law passed to enable the town committee to contract out the working and improvement of roads, using whatever money might be voted at town meeting for this purpose. We expected to raise a considerable sum, say five thousand dollars, yearly, for the roads. Political and local jealousy killed this scheme.

Last winter there was a law passed enabling any road district in this township to tax for roads, upon the assessed value of the real estate, within its borders, a sum not exceeding two and one-half mills per dollar. Two districts have enforced this law, and last summer made very great improvements in their roads.

I understand that this last law is copied from a law which has been in operation for some years in Shrewsbury township, where their roads are in good condition.

As to the construction of roads, I am not acquainted with the engineering principles followed by our ordinary district overseers. Roads are usually worked after corn-stalks are hauled home and when frost is beginning to set in. As a matter of course, they are the worst mud-holes in the township. If any miserable way-farer can find a track through a woods or field parallel to the highway, he often follows it in preference to the public accommodations.

Turnpikes are usually built with slopes not exceeding five degrees, and with a road-way about sixteen feet wide, formed by throwing the earth from each side to the centre, leaving ditches on either hand for drainage. This system is good in a region of clay or clay loam. But in sand the ridge soon settles away unless well covered with clay, even then frequent repairs are needed, for heavy carting soon wears holes through the clay.

The charters usually require that turnpikes should be covered with gravel. What is gravel? I have heard this question learnedly discussed by counsel on a turnpike trial in Freehold. My inference is that the courts will allow great latitude, both as to the building material, and the size and nature of the stones constituting gravel. Our best roads are covered with a gravel consisting of small angular stones bound by a stiff clay loam. There are no accurate rules as to the proportions of the materials. The kind of gravel used is generally settled by cost of transportation.

The turnpike from Middletown to Red Bank, four miles long, cost in its first construction about eleven thousand ($11,000) dollars. It requires to be scraped on an average about once in two weeks. Each scraping costs about six ($6) dollars, the road being twice gone over. Four horses and two men are employed, receiving for pay eighty cents per hour. There are two toll gate keepers; they are paid two

hundred and twenty ($220) per year, besides house rent. This road is one of the best in the county.

As to the profits of turnpikes, they are not generally thought to be paying investments. The statements I shall now make are merely a current report. I possess no accurate knowledge.

The turnpike from Red Bank to Eatontown,						$3\frac{3}{5}$	miles, pays about			7	pr. ct. pr. annum.
"	"	"	Shrewsbury	"	Colts Neck	7	"	"	5	"	"
"	"	"	Holmdel	"	Keyport,	$7\frac{1}{8}$	"	"	8	"	"
"	"	"	Middletown	"	Red Bank,	4	"	"	0	"	"
"	"	"	"	"	Keyport,	6	"	"	0	"	"
"	"	"	Colts Neck	"	Freehold,	5	"	"	0	"	"
"	"	"	Holmdel	"	Mattewan,		"	"	0	"	"
"	"	"	"	"	Red Bank,	$7\frac{1}{2}$	"	"	0	"	"

Of the roads from Freehold to Keyport, I have never heard any statements.

You ask for my views about the improvement of roads. It seems to me that as to ordinary wagon and carriage roads each locality should be left to itself. It would not be just to make one part of a State or county pay for the roads of another. As soon as a section of country possesses sufficient wealth and inhabitants to require good roads they will be surely constructed. To illustrate by this township, according to the assessor's book there are (23,000) twenty-three thousand acres of land. There are about (900) nine hundred voters. Deduct from these, mechanics, watermen, professionals, men of leisure &c., there will be left about (500) five hundred agricultural laborers to take care of (23,000) twenty-three thousand acres, or one man to forty-six acres. If one-third of the land is forest or swamp, the proportion is one man to thirty acres. It is absurd to suppose that the energies of five hundred men spread over so large a surface, can raise enough produce to make its transportation pay any large sum, for expenditure on one hundred miles of roads. Our old roads have satisfied our necessities so far. But I trust that within a few years an increasing population and increasing wealth will cover our beautiful hills with a net-work of the finest drives in the world.

Yours respectfully,

GEORGE C. MURRAY.

Middletown, Feb. 2, 1875.

In Camden, Burlington, Gloucester and Salem counties, the most traveled roads have also been improved by turnpike companies. In eastern Burlington and Atlantic some very satisfactory work has been done by order of the people in town meeting, and the expenses have been met by general tax.

In Union county, the townships of Union and Linden each have special road laws, in which a leading feature is the enlargement of the district.

In Mercer county, there is a special law for Princeton, in which all the roads are in charge of a Supervisor of Roads, who is appointed by the Township Committee.

In Bergen county, Harrington township has a law authorizing it to appoint a board of road commissioners, who hold office three years, and have full power over making, repairing and improving roads.

In Monmouth county, Middletown township has a special law, authorizing the election of a board of commissioners, with full powers.

Burlington county, Mansfield township has a township supervisor, elected at town meeting, who takes the place of all overseers, is paid for his services and has full powers.

All these laws are of recent date, while they vary much in their details, they agree in showing the effort which is being made to improve our means of communication.

REPORT UPON THE EGG HARBOR CITY AGRICULTURAL FAIR.

BY F. S. REGENSBURG, ESQ.

PROF. GEO. H. COOK, *Secretary State Board of Agriculture.*

DEAR SIR:—In compliance with the resolutions of the board, as passed at the spring session, held at New Brunswick, I hereby present you a report of the fairs held in and for this, Atlantic, county, during the past fall.

The fair of the Egg Harbor City Agricultural Society, held on September 28th and 29th, requires especial mention, as the occasion was, as in former years, made the opportunity for exhibiting the various agricultural and industrial products of Atlantic county. This last was the fourteenth fair arranged by the society, and despite the serious drawback our producers experienced, by cause of the severe droughts of the preceding summer, the exhibition in many respects excelled those of former years. Our agriculturists and horticulturists appeared to vie with each other as to who could show the best specimens, and that not single specimens, but bushels of the choicest variety of potatoes, and wagon loads of "display" of vegetables, together with the several varieties of grain, all of which find our soil well adapted to their production. South Jersey has often been sneered at, and it has been said that not even corn would grow; to all such skeptics a visit to our next fair would work wonders.

In the horticultural department there were to be seen many bushels of all, or almost all the known varieties of apples and pears,

and they were of a size and quality which might be termed wonderful. It was only to be regretted that New Jersey's Pomologist, P. T. Quinn, Esq., was prevented from being present; his attendance would have been beneficial "all around," as some expressed themselves.

Of grapes especially there was a grand display; among the varieties on exhibition may be named: Catawba, Delaware, Venango, Martha the best of the Rogers' Seedlings, Concord, Ives, Franklin, Clinton, Herbemont, Cynthiana, Hartford Prolific, Norton's Virginia Seedlings, and quite a number more, for there is hardly a variety or kind of grape that will not adapt itself to our climate or soil, the latter being especially well suited to the growth of the grapevine; however, still more so after the iron stratum that underlies this soil, from ten to twenty-four inches below the surface, is broken through, or in other words, if the ground to receive the vine is completely turned over to the depth of two feet. The expense in doing this is quite heavy, but the second year's harvest, (and sometimes the first,) will pay for the additional outlay. No fertilizers are used excepting a little stable manure around the newly planted vine.

Besides the delicious fruit of the vine, there was also exhibited the fermented juice of the fruit, commonly called wine. Our wine growers being numerous, of coure the "brands" are also many. The wines were a feature of the fair, as they always will be; for since the introduction of the grapevine into this county by the German settlers in and around Egg Harbor City, a new branch of industry has sprung up as it were, benefiting not only the agriculturists, but also, pecuniarily, the whole county, if not the whole state. It is the native wine trade. It gives not only employment to the wine growers direct, but also to the coopers required to make the casks; to the glass-blowers, who make the bottles; to masons and carpenters, who are building the wine cellars, which have become a necessity, and other mechanics and business men as well. The wine business is still in its infancy; yet our wines command better prices than those of Ohio, Missouri, or California, for the reason that they are pure, and our climate has the effect (so much desired in the West) of improving their quality with age. The estimated production, as ascertained from figures furnished me by our viniculturists, is about 150,000 gallons of wine for the market, besides a large quantity for home consumption. And many thousand pounds of grapes were sold and sent to the neigboring cities for table use.

To particularize the fair I deem of no necessity, for like all others there were also other departments, and all were well filled, but I shall keep myself to the agricultural topic.

It will be seen from the foregoing that the grape crop is the most profitable on our soil. Then comes the fruit and berry crop, the latter being more extensively cultivated at Hammonton than at any other place in the county. As quite a source of profit the cranberry

must not be forgotten, but as that cannot be planted as generally as the grape-vine, the bogs are more in a body and owned largely by companies.

Concerning the fertilizers used on our soil there is but little to say, the principal fertilizer being well rotted stable manure, or muck well mixed with lime, and often "mussels." Artificial fertilizers are used to only a small extent, in comparison to the area under cultivation, and marl, which many would prefer, costs too much freightage to allow its being used advantageously. Although found in this vicinage, it will not pay to dig it, the beds being at too great a depth.

October 7th and 8th a fair was held at Bakersville, Egg Harbor township, about six miles below Absecom. It was the Fourth Annual Exhibition of the Bakersville Agricultural Club, yet considering the lateness of the season, and the fact that farming is not the exclusive occupation of the "down shore" people, the fair is deserving of credit. Noteworthy were the number of fine horses, cattle and swine on exhibition, in which respect, Egg Harbor City was lagging. The great attraction at Bakersville, however, was trotting, which brought together a large concourse of people.

A society has been formed at Absecom under the name of the "Atlantic County Agricultural Association," which has for its object the securing of a tract of land for exhibition purposes. The Egg Harbor City Society has leased a block from the city for a term of twenty-five years, and improvements are now being made thereon, and the next Fair, will, in all probability, be held in a new and attractive building, especially to be built for that purpose.

I am yours,

F. S. Regensburg.

Egg Harbor City, N. J., Dec. 12, 1874.

The following extract from a Report by Dr. Aug. Voelcker, "On the Sandy District of Northern Belgium," is interesting from its giving the details of the method pursued in improving sandy lands in Europe, and also from its confirmation of the practice which is beginning to be successfully employed in Vineland and in Egg Harbor City and other places in Southern New Jersey:

"Although the soil of this district consists almost entirely of sand, it nevertheless possesses differences of quality, which have determined the comparative prosperity of the localities in which they occur. The best land occurs in the Pays de Waes; and the worst, probably, in the extreme eastern part of the Campine. Naturally, cultivation was commenced where the soil was most promising; and hence, in the Pays de Waes, the population is most dense, the farms and the properties are most divided, and the rents are the highest. To bring

the remainder of the region into cultivation—all of it being naturally more or less barren—required time, money, and, more than all, labor. The process adopted was recorded forty years ago by M. Van Aelbroeck, in his work, *L'Agriculture pratique de la Flandre*, and is nearly identical with what we saw actually in progress near Hasselt, in the Campine, where M. Van Vinkeroy has brought under cultivation about 550 acres in the midst of a region of pure white blowing sand, growing nothing but heather.

"To enable our readers to understand the process, it is necessary to dig a little beneath the surface. The strata are not more than a few inches each in thickness, and consist of the following beds, in descending order:

"1. Nearly pure white sand, from six to seven inches; 2, blackish sand, from seven to eight inches; 3, ochreous sand, thickness unknown.

"The following analyses and explanation of the properties of these soils will probably be found interesting:

"*Composition of three Belgian Campine soils from the neighborhood of Hasselt; proprietor, M. Van Vinkeroy:*

	Soils dried at 212° Fahr.		
	Top Layer.	Intermediate Layer.	Third Layer.
Organic matter	1.690	2.890	1.771
Oxide of iron,	.160	.690	1.010
Alumina,	.040	.417	.727
Lime,	.078	.059	.095
Magnesia,	.110	.180	.459
Potash,	.027	.050	.088
Soda,	.003	.015	
Phosphoric acid,-	.012	.058	.083
Sulphuric acid,	.034	.058	.092
Silica, (white sand,)	98.010	95.790	95.861
	100.164	100.207	100.186

"The top soil contained a little organic matter, in the shape of small roots of plants, readily distinguishable by their form and dark color. The soil, apart from the rootlets, was nearly white, and on heating in an open platinum capsule, appeared to be a whitish sand, tinged very faintly yellow by a trace of oxide of iron. It contained, in round numbers, 98 per cent. of pure white sand, mere traces of potash and phosphoric acid, and only fractions per cent. of lime, alumina, oxide of iron, magnesia, soda, and sulphuric acid. Adding the organic matter (1.69) to the sand, we have 99.70 per cent., which leaves only three parts in a thousand for all the other soil constituents.

"It need hardly be mentioned that this is a soil of extreme poverty. Manure applied to it, we were told, produces little effect—a fact which

finds a ready explanation in the absence of any appreciable quantity of alumina, oxide of iron, and other soil constituents possessing the power of absorbing and retaining the fertilizing substances contained in yard manure.

"The intermediate, or second layer of soil, had a dark brown color, which is due to organic substances of the nature of ulmic and humic acid. Heated in an open platinum capsule, this portion of the soil burned bright red, showing that, mixed, or more probably combined, with the organic acids, there was oxide of iron in sufficient quantity to color the sand, after burning, bright red. The second layer, it will be seen, contained fourteen times as much oxide of iron, and ten times as much alumina, as the top layer. It likewise contained considerably more phosphoric acid and potash than the top soil, and, altogether, is better adapted to sustain vegetable life than the extremely sterile top soil.

"Casting a glance at the analytical results in the third column, the reader will not fail to discern that the lowest layer of this campine soil contrasts most favorably, in all particulars, with the top soil, and that it likewise shows a decided superiority over the intermediate layer. The proportion of oxide of iron, it will be seen, rises in the third layer to 1 per cent., and that of alumina to nearly $\frac{3}{4}$ per cent.; and with this rise we find an increasing amount of phosphoric acid and potash. In its natural state, the third layer had a reddish color, due to oxide of iron. The differences in the amounts of organic matter in the three layers of soil are greater than they appear in the preceding tabular statement; for, in the case of the third-soil layer, the organic matter given in the analyses includes a considerable proportion of water of combination, which, together with the organic matter, is dissipated on heating the soil with a view of determining the amount of the latter, whilst in the top and intermediate layer, the organic matter includes scarcely any combined water.

"The preceding analyses are interesting, for they clearly demonstrate the propriety of bringing up the lowest layer, which is by far the most fertile of the three, and mixing it with the second layer, and turning the all but completely barren top soil to the bottom.

"The poverty of all the three layers in lime is very marked. Lime performs important functions in the vegetable economy, and is itself a constituent which enters largely into the composition of the mineral portion of all our agricultural crops. It cannot, therefore, be doubted that an abundant supply of chalk or lime, or, better still, clay-marl, would greatly improve the productive power of these campine soils. Indeed, lime in some form or the other should be freely incorporated with these lands, if it is desired to effect a radical improvement in its agricultural capabilities. The propriety of freely applying lime to this kind of land receives an additional support in the fact that the intermediate-soil layer is full of organic acids, or

so-called sour humus, which require to be neutralized by a base, such as lime, before they can become plant food.

"The autumn before the land is to be brought into cultivation, the heath is cut, and, preferably, used during the winter as litter for stock, otherwise it is left to rot on the compost heap. While the weather permits, the land is dug with the long Flemish spade to the depth of about two feet, the top layer being completely buried, and about fifteen inches of the two lower beds mixed and brought to the surface. The cost of this operation ranges from five or six pounds ($25 to $30) per acre, up to a much larger amount, but it bears no proportion to the thereby increased value of the land; for the rental immediately after reclamation may be placed at thirty shillings ($7.50) per acre, while the land was previously worthless for farming purposes.

"In this manner, especially in the Pays de Waes and the district reaching westward to the Polders, was originally brought into cultivation; but in many parts of the Campine the soil is still a pure white blowing sand, and is still in its primitive barrenness. For thousands of acres together the country consists of a vast plain of heather, relieved only by patches of pine forest. Comparing this picture with the artificial productiveness of the region between Antwerp and Bruges, it is almost impossible to believe that what we now see in one province was, a century ago, equally characteristic of large portions of the other; but what now prevails in Flanders—what has excited the admiration of agricultural travelers for the last half-century—is unquestionably the result of incessant labor, combined with marvelous frugality.

"Forty years ago the concurrent testimony of numerous writers pointed out the farming of Flanders as the most productive and the most advanced in Europe."—*Report on the Agriculture of Belgium, by Dr. Augustus Voelker and H. M. Jenkins, F. G. S., (Reporter.) London.* 1870.

There have already been sufficient trials to prove that what has been attended with such striking results in Belgium, is equally well adapted to our own diluvial and drift soils, which cover most of the southern half of the State. Steam-plowing must now be brought in to do the work in our country, which the cheap labor of Belgium has enabled her farmers to do by the use of the spade. For the proof that such work will pay, we may refer to the Report on the Fair at Egg Harbor, and to the communication of Charles K. Landis, Esq.

ON RAISING SWINE.

BY ISAAC FENIMORE.

LUMBERTON, Burlington Co., N. J., Dec. 24th, 1874.

MR. HENRY I. BUDD—

DEAR SIR:—I confess that I have had more or less to do with the management of hogs; but writing about them is an entirely new business for me. Until within a comparatively short space of time, in this section, little attention has been paid by breeders and feeders of swine, to others points than that they should attain such a weight in a given time, without much regard being paid to the quality thereof, or the amount of feed it required to accomplish the same; but as civilization has advanced, our appetites have become more refined, and we, of necessity, have had to seek for new or improved material suited thereto: thus new and better breeds have been introduced, till, at the present time, we have them in numbers, each vieing with the other for supremacy.

The Jersey Reds and Chester Whites, together with their crosses, till within a few years, have formed the bulk of the hogs that have been fed in this section. The Jersey Red is of good size, inclining to be rather coarse in structure, and somewhat indifferent in quality; of a quiet disposition, and, if fed a considerable length of time, apt to attain tolerable heavy weight. The Chester White is also of fair size, more neat in structure, and of a somewhat better quality than the Jersey Red, quite liable to mange, and, according to my experience, a very irregular breeder; sometimes their pigs being all you could ask for, and at other times, very indifferent in size and structure.

There are five distinct breeds of improved hogs, the Berkshire, Essex, Yorkshire, Suffolk, and Poland China, that have several qualities in common with each other—which are, a natural tendency to carry flesh, (consequently easy keepers,) and a predisposition to neatness, therefore heavy in the material and light in the immaterial parts. In other respects, these breeds differ essentially. The Berkshire, though for form and size what might be called a model hog, is very uneasy in disposition—an inveterate mischief-seeker. The Essex, to me, has two objections: first, his jet-black color, which renders him liable to dress badly; secondly, his diminutive size. The Yorkshire and Suffolk, though of fair size, and very docile disposition, have a serious inclination to be light in the coat—in some cases amounting to almost none at all. I have seen their skin cracked, in consequence of this exposed condition, in such a manner as to render the surface of their body one entire scab.

The Poland China, a breed which I have selected of the improved breeds, and have handled, to the exclusion of all others, for the last two or three years, is spotted (black and white) in color, coat very

uniform and smooth; never known to mange; larger than any of the other improved breeds, often reaching great weight. One notable instance in this regard is recorded of a number of farmers in the neighborhood of Monroe, Butler county, Ohio, where a number of them clubbed their hogs together, to the number of 625, averaging 546 pounds; twelve of the same hogs averaged 773 pounds. They are very docile in disposition, and great grazers. I don't remember ever seeing pigs of other breeds grazing in groups so contentedly as those of this stock habitually do. I have had near one hundred of them (hogs and pigs) on my farm, the past season, and had no more difficulty in managing them than I would in the management of an ordinary flock of sheep.

The hogs that I have butchered this season were sold to Kenna & Swope, of Federal street, Camden. At time of delivery, I stated to them, that there had been claimed for this breed of hogs, that their meat was of a better quality and consequently worth more than the ordinary hog, that there was a greater amount of flesh interspersed through the fatty parts; I told them that this claim amounted to nothing if actual experiment would not prove it to be a fact; I thereupon requested that in working them up they would have an eye to what were the facts in the case; since which time they have informed me that they found by actual experiment, that 2500 lbs., of these hogs of the same fatness, would yield as much sausage as 3000 lbs., of ordinary hogs; sausage selling one season with another from one-fourth to one-third higher in price than lard; thus making good the claim before made.

In breeding procure the best sows that can be got, and by all means avoid using a male of the same parentage, better give the last one you have away, and pay double price for one that is no better, that is not too near akin; my experience has inclined me to the belief, that after having selected a desirable family of hogs, it is better to breed within that family, and by all means use a full blood male, by this means you secure the very type of hog you desire, together with that uniformity of make and size so much admired by lovers of good stock, and avoid those nondescripts which are hardly worth the name of hogs, which are so often the result of indiscriminate cross-breeding. From the middle of April to the middle of May is the favorite time with me to have pigs to come, cold weather, that great enemy to young pigs, is then about over, and they have a long season of temperate weather before them for growth and development.

In feeding I would recommend the use of cooked food as much as practical, and a variety thereof, some vegetable and some animal; I have known hogs when fed on one kind of food only for a length of time, say, corn for instance, to lose their appetites, and in a great measure refuse to eat; I think the reason of this is that the feed given has too much of a tendency to develop one part of the system, while

others receive little or nothing adapted to their development, consequently the parts are, as it were, at war with each other; the animal becomes uneasy, is constantly on the search for something, and instead of being that fat, sleek-coated, and contented creature which any farmer likes to see about him, is transformed into a rooting, squealing, rough-coated animal that is hateful to the sight; my theory in this case is that the animal needs a change of food, a variety that will nourish all parts of the system, and create that happy equilibrium of the parts which was designed by nature; I would at all times and under all circumstances, both for hogs and pigs, recommend a sufficient quantity of nutritious food to keep them constantly developing and growing, and also good warm, dry, and well ventilated shelter, to keep them at all times comfortable, and avoid using for this purpose, that which should be retained upon the body for the owner's profit.

One of the material profits in keeping hogs, is their manure, and we can ill afford to neglect this matter; avoid letting them run in lanes and by-ways where their manure will be washed away and deposited in the bottom of some creek or river, and consequently benefit no one, at least not for many generations yet to come; confine them as much as practical in a comfortable enclosure, and keep constantly throwing in litter and such other refuse matter as may come to hand, to be converted into manure, and this will be found to be one of the largest items of the hogs account.

Yours respectfully,

ISAAC FENIMORE.

ON RAISING SWINE.

BY H. J. BUDD, ESQ.

Mount Holly, December 22, 1874.

Professor Cook—

Dear Sir:—Failing to persuade some of our successful hog-breeders to comply with your request, I will give a few facts from my own experience, having fatted from ten to fifteen thousand pounds annually, for a number of years.

The breeds that Burlington county farmers fancy, are various. The Jersey sandy or red seems to have originally been the leading hog, and I believe has never been excelled in size or weight by any breed that has followed him. This breed still maintains its purity in some parts of our county, but in most sections has been mixed with the Chester, Suffolk, Berkshire, Essex, and, more lately, with the China-Poland, until but few of our farmers possess any distinct breed.

The China-Poland, introduced into this county by James Lippin-

cott, of our town, is in color black, spotted with white, and is thrifty from the first inception; pigs possessing the peculiarity of always being fat, or in good killing order, when supplied with a fair amount of feed, which cannot be said of many of our mixed breeds. In its crosses with our mixed breeds, it has imparted that quality to them.

Our best farmers introduce the boar, or male hog, during December, having the sows to pig during April. The sows, eight or ten days before farrowing, are placed in separate stalls or enclosures, where they must be provided with warm beds, made with rye straw—(wheat and oat straw are injurious to the pigs)—where they are confined about four weeks, or until the weather is settled or warm, and the pigs are strong enough to care partly for themselves, when sows and pigs are turned all together in one lot or field. Some of our farmers, for a short period, confine their pigs, allowing the sows to roam, except when sucking the pigs. As soon as the pigs manifest a desire to eat, they are fed a little shelled corn in a pen by themselves.

When the pigs are from three to four months old, all the sow-pigs that are not needed for future breeders, also the old sows, are spayed, after which they quickly wean the pigs. Some farmers wean their pigs at these times without spaying the sows; but spaying is much the better plan, as it destroys the future heats, and, consequently, easier fatting follows. The pigs are then kept in a thriving condition until December, by feeding with house-slops, wheat and rye bran swill.

The pigs that we desire to fat this winter are then placed in pens and fed new corn on the ear, until they tire of it; then shelled corn in a trough, with water, is substituted; then comes ground corn or Indian meal, soaked with water, after which follows scalded Indian. The time of fatting is about two months; weight reached, two hundred to two hundred and fifty pounds—sometimes three hundred pounds.

The pigs to be kept over until the next winter are selected, picking out the most growthy. These range over the grass or rye pastures, and are fed with the slops of the house, and enough corn to keep them growing without fattening. Those who feed steers with grain during the winter, allow their pigs to pick up the most of their living from the droppings of the cattle.

These store hogs are provided with warm beds, but must not be allowed to bunch or crowd each other—crowding produces steaming, and consequent skin affections, coughs, and other diseases, which, sooner or later, destroy the animal. A long shed, divided into four and eight stalls, I have found the best remedy to prevent this disposition.

When the grass reaches the pasturing height, good clover feed is all they need until the harvests are gathered, when they glean the waste of grain fields, after which, for early fatting, say about the first of August, they are fed a thick swill, made of water and ground rye. This, after a few weeks, is followed with old ground corn soaked with

water, succeeded with new corn, when solid enough to feed. Plenty of water to wallow in, is necessary at this stage of the fatting, to correct the extreme heats that prevail at this season. This early pork is then sold to the sausage men, from the first of October to the last of November, generally at an advanced price, commencing this year at $12 per hundred weight, and running down to $9.50 the last of November.

For late fattening, the hogs are first lightly fed in the fields on "awful" or the sortings of the best corn, when this is consumed the hogs are penned and fed with sound corn on the ear until they begin to eat it daintily, when shelled corn, soaked and scalded Indian follows in succession.

To preserve the appetite of the hogs or force their feeding, we provide them plentifully with brick-bats, charcoal, rock salt, ashes and lime, and they will consume a wonderful supply of all these articles.

Our early fed hogs are made to average about three hundred pounds each; our late fed about four hundred pounds, and are bringing at this writing from nine and one-half to ten cents per pound.

We count much on the manure made, consequently we give them a small enclosure alongside of their feeding pen, where we frequently introduce straw, leaves, stalks, muck, or any coarse matter that they will work up with their droppings. Quiet and comfort are essential to successful fattening, therefore this enclosure should be on the warm or south side of the shed and feeding pens.

An average hog farmer, say possessing one hundred and fifty acres of land, winters, summers and fats, each year, about twenty-five hogs, making about ten thousand pounds of pork; (a farm of double size, forty to fifty hogs,) what his old hogs lose in weight he will probably more than make up with pig pork, of which he generally fattens more than enough for home consumption.

It is difficult to state the profit arising from this stock, much depending on the management, the thrift of the hogs, the price obtained, which is variable, and the price of rye and corn, which is also very changeable.

Our general estimate is that we can, under ordinary circumstances, make about ten pounds of pork out of one bushel of corn, therefore, when corn is worth sixty cents per bushel, pork can be made for $6, eighty cents, $8, $9, $10, per hundred weight, so on up and down the scale.

I do not think, from experience, that the profits from hog raising and fattening are often excessive, and don't believe, if all their feed had to be bought at market price, there would be any in our portion of the country; but they live from four to six months on grass, the amount of which consumed by each hog is not highly valued, and they represent the accumulated waste of the fields, house, and barn, the which, if we had no hogs, we would get but little account of. They are the gleaners of our barn-yards, rye, wheat, and corn fields,

and consume the sortings and refuse of grains that would probably find no other profitable market.

The sandy hog is coarse-limbed, heavy-eared, thick-skinned, and open-built, requiring a long time to thoroughly fatten, but is hardy, free from scurf, produces a great deal of fat meat, and is prolific of lard. The Berkshire, Essex, and Chester sometimes make with it a good cross, reducing the size, but improving the texture of the meat.

The Poland-China is finer-limbed, thinner-skinned, and like the Berkshire, produces a lean ham, (though not quite so lean,) is fancied by the sausage-maker for its large proportion of meat to fat, and so far as tried, is the most profitable to the feeder.

Our experience demonstrates it is difficult to keep our hogs up to the standard. Careful selection and change of boar each season, and close study of desired points often fail to keep our stock from deteriorating. In this as in most other pursuits "constant vigilance is the price of success." Yours,

H. J. BUDD.

NOTES ON POULTRY RAISING.

In several counties of our state considerable attention is given to raising poultry and in improving the stock by the introduction of new and superior varieties. Much has been effected by associated efforts through society meetings and exhibitions. The Middlesex County Farmers' Club has had two "poultry shows," the last of which, in the winter of 1872–73, was unusually fine and brought together many varieties of improved stock, as well as some of the more fancy breeds, from all parts of the state. "It was a decided success," and the distribution of stock from it was of great value to our poultry yards.

The most active and vigorous society devoted to poultry is the "Monmouth County Poultry Association," organized two years ago. "Its object is the improvement of the breed of poultry, and with this end in view it holds an annual exhibition in the winter, (December or January.") Mr. J. Henry Vanderveer, of Freehold, one of its members, writes: "We flatter ourselves that we can show as good stock as can be found in the country. At our last show there were fowls on exhibition that were valued at $50 each, and it has now got to be a common occurrence for us to sell chickens from $5 to $10 apiece. I had on exhibition, in December last, a light Brahma, less than a year old, that weighed twelve and three-quarter pounds. As the result of our labors in this direction, we can now point to numerous yards of first-

class, thorough-bred poultry, worth from one hundred to five hundred per cent. more than the common 'dunghill' fowls of former days."

This association holds quarterly meetings for the transaction of business, at which an essay on poultry is read by a member appointed for that purpose. This society, with its officers, &c., will be found in the list of agricultural societies in this report.

In Burlington county a large amount of poultry is sold to the New York and Philadelphia markets. Mark H. Busby, of Masonville, in that county, sent the following statistics of a portion of that county: In 1873 there was shipped from Masonville, and from Rancocas village, (in part, two shippers only) 286,047 pounds of poultry. In one day, (December 22d,) the amount reached was 15,517 pounds. He considers this sum as not over one-third of the aggregate of the county.

H. J. Budd, of Mount Holly, writes as follows on the subject of poultry:

"Poultry raising and fattening for market has, in this county, assumed vast proportions. Four of the fourteen poultry shippers to New York and Philadelphia markets have replied to inquiries:

J. H. Leeds, Rancocas, reports	300,000	pounds.
R. R. Lippincott, Rancocas, reports over	200,000	"
Nippins & Taylor, Mount Holly, reports	45,597	"
Levi Rogers, Hartford, reports	23,000	"

The prices given are from twenty-five to thirty-five cents per pound for capons, fifteen to twenty-five cents for chickens, fifteen to twenty cents for turkeys, and fourteen to sixteen cents for geese.

"J. & T. Black, of Springfield township, realized about $2,000 for their last year's flock; quite a number of our farmers obtain each year from $800 to $1,200 from this source, while ordinary attention is rewarded with three, four, and five hundred dollars to each farmer.

"The only drawback to its becoming the leading interest of our farmers is the chicken cholera, which counts its victims by thousands; but of 1,200 head I have this year lost 500; many of my neighbors had their yards entirely stripped. I have for four weeks checked the disease by confining the fowls in an enclosure where they could get nothing but copperas water to drink.

"The disease causes the liver to swell to double the natural size, followed with severe diarrhœa and strong desire to drink water. In such cases they droop from two to ten days and then die; but others, apparently well in the evening, in the morning will be found dead under the roosts.

"The discovery of a remedy or preventive will save thousands of dollars to the farmers of this and other states."

Mount Holly, December 28th, 1874.

ON POULTRY RAISING.

BY ROB'T. B ENGLE.

Having been somewhat successful in the chicken business, I will give the result of my experience for what it is worth. My first care is to select the complement of pullets that I wish to keep from the best and earliest that I have. Have crossed my fowls with the following Asiatic breeds, viz.: Dark Brahmas, Buff and Partridge Cochins, as well as bred the above named varieties pure, which I do by keeping them in large picketed enclosures. And having had experience in the varieties named, I place the Partridge Cochin at the head of the list, as combining more good qualities than any breed I know of. They are a fine, large, broad-breasted, short-legged fowl, with beautiful plumage, are naturally very gentle, are good layers and sitters, and make the best of mothers. And last, but by no means least, they make the most attractive appearance when dressed, of any fowl I ever saw, and the quality of the flesh is second to none. We commence setting as early in the spring as the weather and the inclination of the hens will permit, and seldom set any after the last of June, as the weather then becomes hot, and they are more liable to get lousy in the nest. Our feed for the young chicks is wheat screenings and cracked corn, with plenty of pure water to drink. Our plan is to feed well at all times, believing that a chicken that is strong and well fed is less liable to disease than a weak, half-starved one. We keep their coops and roosts clean and do not allow the droppings to accumulate, but put them away in a dry place to be composted with marl in the spring for corn-hills ; have saved, some years, over eighty barrels of the pure article, which I consider very valuable.

I think it a good plan to scatter them as much as I can, both as regards their places for laying and putting out the young chicks, applying the same rule to their roosting places when deprived of their coops. As disinfectants we sometimes use carbolic acid by saturating saw-dust with it and spreading it under the roosts, and whitewash their quarters, adding carbolic acid to the wash. I have never had the cholera among my fowls. When the chickens are old enough, (about three months old,) we have most of the cocks caponized, always selecting some of the finest formed and most promising to supply ourselves and the neighboring demand with breeders, having, last year, sold over one hundred cocks for that purpose. We never sell them young, except the very earliest spring chickens, never selling them when the price gets below thirty cents per pound, believing it is better for us to let them get their growth. I sell *my own chickens direct to the consumers* in Philadelphia market, commencing in November and aim to go regularly once a week until my crop is disposed of. My capons I reserve until after the holidays to avoid bringing them into competition with turkeys.

We coop or pen them up a few weeks before killing, keeping a good supply always up to draw from, and do not kill a chicken until *fat and fit to kill*, not suffering them to get any food the day they are killed, preferring to get a good price for the *meat* I sell, to getting a less one for my sour feed. Generally speaking, I like to have large crops, but do not want them on my chickens when dressed for market. I have never found anything better than corn, either cracked or whole, for fattening chickens, supplying them with plenty of drink, gravel, or coal ashes, particularly of the latter, of which they are very fond.

And now comes a very important part in the programme—that of dressing or *undressing* them for market. And the greatest art is in sticking them properly. My plan is as follows: hang them up by the feet, having a barrel at your side to receive the feathers, (we pick dry,) then insert the point of a sharp, narrow-bladed knife into the chicken's mouth and down its throat, cutting outwards towards its ear, and severing the large vein, then, immediately, before withdrawing the knife, run the point out through the bone of the neck, just below the joint, so as to *pierce* the *spinal marrow* or *pith* of the *neck*, when the flesh *immediately relaxes* its hold upon the feathers, which, if you are quick, you can remove without fear of tearing the skin, although you pull off all you can grasp at once; one minute is sufficient to remove all the large feathers, if the fowl is properly stuck. I have a weight with a hook attached, which I hang in the chicken's mouth as soon as I stick, to keep it from raising its head to bloody its body. We do not wet the body, as the skin presents a nicer appearance when kept dry, washing only the feet and head; they are also in better condition for shipping when picked and kept dry. I make it a rule never to sell an old one for a young one, but make a difference in the price and give the reason; have followed that plan for sixteen years, and have established a custom that is very valuable.

My crop for several years has amounted to from $1,000 to $1,500, three years ago it amounted to a little over the latter figures. Capons usually bring from five to seven cents per pound more than common chickens, and I think they pay from thirty to thirty-five cents per pound; three years ago, forty cents in April. The poultry crop of Burlington county is very valuable, and I presume it furnishes more first-class poultry for the markets of New York and Philadelphia than any county in any state.*

I have given the result of my own experience without wishing to appear egotistical. If it is of any value the public is welcome to it. If not, perhaps it will at least do no harm.

Masonville, Burlington county, N. J., February 10th, 1875.

*Henry J. Budd, Esq., of Mount Holly, says: "I have made an effort to find the amount of poultry shipped from this county last year, but can only approximate it. Ten dealers have shipped over one million pounds during the past year."

CRANBERRY GROWING IN NEW JERSEY.

BY E. W. CRANE, OF CALDWELL.

To the State Board of Agriculture of New Jersey:

Cranberry growing having become a specialty in the southern portion of our state, and one in which no inconsiderable portion of our citizens are either directly or indirectly interested, on the invitation of your secretary, I have prepared for your second annual report a few facts in relation to it, which have been suggested as well by the writings and hints of others engaged in the business, as from a somewhat limited experience of my own as a practical grower of this fruit.

Few localities having all the conditions for successful cranberry growing are found in this, or, in fact, any country, as a peculiar combination (of soil, sand, water, and climate,) but seldom met with, are required. The cranberry growing district of New Jersey is included principally in Ocean, Burlington, and Atlantic counties, although smaller sections of Monmouth, Middlesex, Camden, and Cape May counties are suitable for their growth.

First Attempts in New Jersey.

It is now a little over thirty years since John I. Webb, of Jackson township, Ocean county, made the first attempts toward cultivating this fruit of which we have any record in this state, at his place, on which he still lives, a few miles from Cassville; but it is only within the last ten or fifteen years that much attention has been given to its growth.

Cultivation in other States—Comparisons, and Advantages of New Jersey.

The cranberry had been successfully cultivated on Cape Cod for some years previous, and has also since been grown to a considerable extent in some parts of the west, particularly in Wisconsin.

New Jersey, however, still exceeds any other state in its cultivation and production, and from advantages of location, climate, markets, &c., will probably continue to do so.

Cape Cod and Wisconsin are more liable to both early and late frosts, which are sometimes very destructive to the fruit.

The quantity of cranberry land in the former is much smaller than in New Jersey, and already well occupied.

In Wisconsin the cost of cultivation is considerably less; but in addition to greater liabilities to frost—on account of the difficulty of obtaining sand, (which is so abundant in South Jersey,) for spreading

over and renewing the vines, there is said to be a much greater probability of their "running out" after a few years.

The peculiar position of the cranberry growing district of New Jersey, between the two great markets of our country—New York and Philadelphia—and so near to each, also gives it an advantage for marketing over that of any other state.

The Pines.

This district is situated in what is called "The Pines," which, up to a quite recent date, had been but little cultivated, principally on account of the lack of railroad facilities for shipping the small fruits to which a considerable part of the soil is adapted, as well as for transporting the marl, which is for that section an invaluable fertilizer.

General Observations.

The increase of these facilities within the last few years, together with the influx of both men and capital from various parts of this and other states, attracted by the remarkable success which in many instances has attended the cultivation of the cranberry, has made numerous and most favorable changes throughout this entire section, and portions that were once thought to be the most unpromising and worthless lands in the state, have become the most productive. Such results, however, have not been invariably attained, nor without the expenditure of much capital, study, and labor, together with the exercise of good judgment and patience. But one side, however, would be told, were it not said that many failures have also occurred; the causes of many of these may be readily assigned by experienced growers, but some have occurred, against which, with our present knowledge, it would seem almost impossible to provide. A great deal has been learned within the last few years in regard to this branch of horticulture, but much still remains to be learned, and to accomplish this, to extend the market for the fruit, and to the improvement of their cultivated lands, many of the most thoughtful and prudent growers are now devoting their energies, rather than to extending their acreage of cultivation, fully believing that the experience and advantages thus to be gained, will ere long enable them to renew their aggressive labors in their wild "bogs," with much greater economy and certainty of success. That this view is correct, I think there is little doubt among those who have given this and similar matters their earnest attention.

Cultivation, Locations, &c.

The most favorable locations for cultivating cranberries are muck

or peat bottom lands, drained by streams *flowing through* them, and by which they can be completely flooded in the winter season—bordered by ridges of pure sand, and so situated that there may be a free circulation of air. They are also grown on savanna land—a mixture of sand and peat—but do not yield as large crops as on bottom lands, nor, on the other hand, are they as expensive to prepare.

Preparation.

After clearing the surface of the ground, it must then be turfed or scalped, and thoroughly drained. The turf is used for leveling, where needed, and for the dam, which is built with two walls of it, filled in with sand, the turf between them having been first removed to the sand beneath, so that the filling may rest on a firm foundation of the same material. The width of these walls must be in proportion to their height and the amount of water to be held by them.

The system of drainage generally consists of the main water course—which must be cleared out if necessary, so as to give free passage to the water—and side drains running into it. These laterals should be of such distances apart, as the nature of the ground requires, (generally, in good bottom lands, about two rods,) and the surface between them slightly rounded. *Pure sand* without mixture of loam, clay, seed, or any other foreign substance, is then applied to the depth of from four to six inches, in which the vines are set, about twenty inches apart; this may be done at almost any season of the year, except winter, though spring is generally considered the most desirable time.

The vines "run" readily on the sand, which seems to stiffen them, and increase their productiveness, and it also has a tendency to prevent the growth of weeds. The sand is generally brought from the adjoining banks, if a long distance (or a wide plantation,) with a hand car and portable track, or if the distance is short, by wheelbarrows; it is sometimes also thrown up from pits sunk in the sand below the mud, the pits being afterwards filled with turf and other refuse, and after settling, covered with sand. Savanna lands are plowed, without sanding, and a considerable expense is thus saved, but the most satisfactory results are usually obtained from lands which are prepared at the greatest expense, if the work is judiciously done. Cedar swamps are generally more difficult and expensive to work than other lands, but often give the best results, on account of the superior quality of both peat and sand. No land, whether peat or savanna, should be prepared, that cannot be entirely flooded, and it should be done from December until May. Flooding is an effectual remedy for the vine and fruit worms, and one which growers cannot afford to neglect, for many crops have been entirely lost by the ravages of the former. Water also protects the vines from frost, and the sediment deposited fertilizes them.

Picking, Shipping, &c.

The cranberry harvest begins in September, and extends through the month of October. It furnishes employment to thousands of hands, generally at fifty cents per bushel. The quantity picked per day varies from one to four bushels each, usually averaging about two bushels. The pickers generally use peck boxes or baskets, and empty these, when filled, into crates or barrels, receiving tickets or checks for the same from the overseer, which, in settlement on pay-day, represent the amount picked. These crates and barrels hold one bushel and three bushels respectively. A large proportion of the fruit is shipped to the dealers of New York, Philadelphia, and other places, either direct from the plantation, or without further assorting than that given (if any) at the time.

A better system, however, is to store the fruit in well ventilated buildings, and to ship more gradually—as required by the trade; always assorting, if necessary, as it most generally is, if kept any length of time, and filling the packages (which it is important to have of the regular standard sizes) *full*. This plan, if generally practised, would keep the markets from being filled and "glutted" with inferior fruit, (much of which should never be shipped,) and at the same time keep it well supplied with that of good quality. Sometimes a very little "looking over" of the fruit makes a great difference in its appearance and price—and although a somewhat tedious process, if done by hand, recent inventions have materially lessened the labor. Rev. Dr. J. H. Brakeley, of Bordentown, owns the patent of the best screen for the purpose that I have yet seen; while for berries that need *more than screening*, Mr. D. T. Staniford, an experienced grower, of New Egypt, Ocean county, seems to have successfully solved the problem of removing the soft and scalded fruit, or, at least, a very large proportion of it, by a machine which he has recently invented for the purpose. More attention to these particulars would doubtless be of advantage, as well to growers as to dealers and consumers.

Yield—Statistics, &c.

As considerable land has been set with cranberries which is entirely unfit for them, it is doubtful whether an average crop of more than fifty bushels per acre is obtained, though, with good land, it should at least be double that amount, while two hundred bushels, and even more, per acre, have frequently been reached.

N. H. Bishop, Esq., raised over four hundred bushels on one acre of his model plantation at Manahawken; and parts of acres have yielded at the rate of from 700 bushels to 1,000 bushels per acre; but these are exceptions, not the general rule.

Other and interesting figures in relation to this interest will be

found in the valuable Report of Mr. N. R. French, Statistician of the New Jersey Cranberry Growers' Association, as published in its official organ, the *Bricksburg Times and Journal*, and which follows this paper, on pages 66, 67, and 68.

Organization.

The New Jersey Cranberry Growers' Association has proved a most efficient aid to those engaged in this business. It is composed of more than one hundred members from various parts of New Jersey, and also numbers from other States, who have invested their capital in the plantations of Southern New Jersey—embracing men who, while they have a common interest in cranberry culture, also represent almost every vocation and profession.

Much has been accomplished by organization that could have been done in no other way.

Standard Packages.

The particulars of the standard measure reform, and sizes of the standard packages adopted by the Association, were given in last year's report. I will only add, that the system continues to grow in favor, and is already very extensively used. Any aid that the Board can give to this reform, or to similar ones for other fruits and vegetables, will be beneficial alike to honest growers, dealers, and consumers.

Dishonest Dealers.

One of the most important reports made to the September meeting of the Association, was that of Messrs. N. H. Bishop and Chas. L. Davis, in regard to the dishonest practices of many commission merchants, as to which growers have heretofore lacked positive information. Their investigations are not yet completed. Messrs. J. J. White and A. J. Rider were added to the committee, to assist in its labors, and their full report is awaited with interest. That dishonesty of the kind mentioned works to the direct disadvantage of honest dealers as well as producers—not of cranberries only, but of fruits and vegetables generally—is well known; and it is of great importance to all, that such an investigation as that instituted by Mr. Bishop should be made, that producers may have given them the means of shunning at least many of the places where these practices form a part of the regular business transacted.

Foreign Trade.

Considerable attention has been given by the Association to the establishment of a foreign trade for our fruit, in which an increasing interest is felt. The most encouraging notices have been given by the English press of the preliminary shipments to England, and very material aid was given to the enterprise by P. T. Quinn, Esq., of the Board of Agriculture, and also Corresponding Secretary of the State Agricultural Society, during his recent visit to England, Scotland, and Ireland. A bill has been introduced into the Legislature to incorporate a company for the purpose of developing this trade, which, it is hoped, will become a law, as the success or failure of the enterprise will have much to do with the future of this branch of horticulture in New Jersey, for the desirability of a foreign outlet for the fruit is increasingly felt; and, once firmly established, would doubtless soon lead to the cultivation of lands which will otherwise long remain unproductive.

The approaching Centennial, at Philadelphia, will also afford a fine opportunity for bringing our fruit to the notice of foreign nations, for which arrangements should, and probably will, be made.

Scald.

Many other advantages have arisen from the organization and meeting together of so many men engaged in the cultivation of cranberries, prominent among which may be mentioned the investigation of the "scald" or "rot." The full reports of the committee appointed for the purpose—Messrs. James A. Fenwick and Frank M. Todd—at the September meeting of 1873, together with the discussions following, elicited about all that was then known on this disease, which was yearly destroying thousands of bushels of fruit; but it was evident that much was still to be learned, for it was found impossible to harmonize the various theories in regard to it, and Mr. Todd very properly suggested an investigation by a scientific expert.

Through the efforts of Mr. A. J. Rider and Revs. Drs. Brakeley and Brown, of the Association, and the valuable assistance given by Hon. Sam'l A. Dobbins and Hon. Amos Clark, Jr., (Pres't N. J. State Agricultural Society,) such an investigation was secured during the past season from the U. S. Department of Agriculture, and conducted by Mr. Thomas Taylor, Microscopist of the Department, who was also cheerfully given such assistance as was needed by the other Divisions. Mr. Taylor entered enthusiastically upon the work, and made numerous examinations in various parts of the cranberry district of New Jersey and on Cape Cod. A single season is not sufficient to determine conclusively a matter of this kind; but much has already been learned, and an interest excited in continuing the investigations and experiments, and carefully noting the results.

Mr. Taylor's reports are not yet completed, and will require at least another season's examinations and practical tests. There seems to be little doubt, however, among growers, that his theory as to the *cause* of the scald, or rot, is correct, as it was confirmed in nearly or quite all of his numerous examinations, some of which were participated in by many of the leading growers of the State. He found that where the berries rotted, a strong smell of sulphuretted hydrogen was almost invariably emitted from the peat, which was in a fermenting state, and that the roots were larger, darker, and more brittle, (and sometimes matted,) than those of vines the fruit of which did *not* scald—frequently, also, showing signs of decay.

That such conditions of the soil produce the scald, he feels fully assured, and recommends the application of lime, as a means of sweetening the soil, which he thinks also will prevent the rotting of the fruit. Many experiments have been made, and the proposed remedy will be thoroughly tested during the coming season, as the matter can be fully determined in no other way. It was also observed that the scald was more prevalent among berries grown on young vines, and that thorough drainage and re-sanding are beneficial—instances of the latter being shown where new and healthy roots were starting from the covered runners, and already taking the place of the older ones, which were diseased and dying.

Mr. Taylor will continue his investigation during the coming season, and it is hoped that satisfactory results will be attained. That the investigation will be productive of much good, there can be no reasonable doubt, for even if the remedy proposed should not prove effectual, the experiments made, and the study and experimenting thus stimulated, will doubtless be the means of discovering it. If any provision had been made in the law creating the State Board of Agriculture for Scientific Investigations, here would certainly be a suitable field for it. As other branches of Agriculture, and horticulture as well, need similar attention, it has been suggested that legislation having this in view, would be desirable, and having a direct tendency to develop the resources of the State, it would seem perfectly appropriate.

Cranberry Statistics, as Reported by N. R. French, September 1st, 1874.

TOWNSHIPS CLASSIFIED BY COUNTIES.	Total area set to vines.	On muck bottom.	On savanna bottom.	Vines set this season.	Vines set one year.	Vines set two years.	Vines set three years.	Vines set four years or more.	Average cost per acre in rough state.	Average cost per acre clearing, damming and planting.	Average cost of culture per acre for three years.	Total investment on entire acreage three years from time of planting.	Crop, 1871.	Average price in market per bushel 1871.	Total market value 1871.	Crop, 1872.	Average price in market 1872.	Total market value 1872.	Crop, 1873.	Average price in market 1873.	Total market value 1873.
BURLINGTON—Townships.																					
Pemberton	977½	442½	535	8	96	139½	84½	649½	$11 00	$133 00	$14 50	$154,933 75	6,365	$3 25	$20,686 25	8,511	$3 00	$25,533 00	15,374	$3 00	$46,122 00
Southampton	210	88½	121½	...	.....	45	79½	85½	9 00	108 00	.....	24,570 00	.....	.....	.....	.....	.....	.....	500	2 75	1,375 00
New Hanover	316	142	174	60	104	26	31	95	34 00	266 66	75 00	118,708 56	.....	.....	.....	11,500	3 25	37,375 00	10,840	3 00	32,520 00
Woodland	158	97	61	...	41	20	25	72	18 00	215 00	.....	36,814 00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Medford	397	257	140	45	65	13	65	209	23 00	166 00	50 00	94,883 00	8,000	3 25	26,000 00	11,200	3 15	35,280 00	11,200	3 00	33,600 00
Little Egg Harbor	73	65	8	...	7	8	8	50	33 00	347 50	80 00	33,616 50	310	2 75	852 50	962	3 00	2,886 00	1,280	2 56	3,276 80
Totals and averages	2131½	1092	1039½	113	313	251½	293	1161	.....	.....	†217 51	463,525 81	14,675	3 23	47,538 75	32,173	3 14	101,074 00	39,194	2 98	116,893 80
MONMOUTH.—Townships.																					
Wall	36	30	6	5	1	.....	.....	30	68 00	422 00	40 00	1,980 00	.....	.....	.....	3,000	3 00	9,000 00	3,660	2 75	10,065 00
Atlantic	40	36	4	...	.....	4	.....	36	40 00	133 00	15 00	7,520 00	.....	.....	.....	600	3 00	1,800 00	600	4 00	2,400 00
Howell	166	144	22	33	.....	15	83	35	43 60	287 00	70 00	66,800 00	700	3 50	2,450 00	3,400	3 00	10,200 00	4,142	2 64	10,882 08
Totals and averages	242	210	32	38	1	19	83	101	.....	.....	†383 05	92,700 00	700	3 50	2,450 00	7,000	3 00	21,000 00	8,382	2 78	23,527 08
OCEAN.—Townships.																					
Brick	*340 249½	472	117½	...	3	6	20½	220	50 00	274 00	90 00	103,293 00	4,208	3 50	14,728 00	4,579	3 33	15,254 33	57,340	2 79	15,997 86
Jackson	640	407½	232½	...	71	90½	100	378½	49 46	302 26	52 85	258,924 80	5,660	3 30	18,678 00	8,148	3 35	27,295 80	20,333	3 00	60,999 00
Dover	358½	258½	100	...	26½	14	43	275	60 00	450 00	40 00	193,175 00	9,714	3 80	36,913 20	9,297	3 15	29,285 55	11,288	2 77	31,267 76
Manchester	178	141	37	...	15	2	11	150	43 00	397 50	34 50	84,550 00	5,636	3 25	18,317 00	4,584	3 25	14,898 00	5,746	2 73	15,686 58
Plumsted	101	46	55	...	33	13	17	38	33 29	216 66	23 75	27,643 70	2,120	3 00	6,360 00	2,600	3 15	8,190 00	2,836	2 90	8,224 40
Stafford	178½	178½	.....	.....	.....	.....	56	122½	58 33	625 00	40 00	129,114 41	11,100	3 66	40,626 00	17,800	3 33	59,274 00	11,040	3 00	33,120 00
Lacey	54	39	15	...	.....	.....	.....	54	38 33	425 00	55 00	27,989 82	505	2 83	1,429 15	1,510	3 25	4,907 50	2,356	3 00	7,068 00
Union	90	83	7	...	.....	12	21	57	35 00	571 43	50 00	59,078 70	1,200	2 50	3,000 00	2,800	3 00	8,400 00	3,819	2 58	9,829 80
Totals and averages	1849½	1625½	564	...	148½	137½	268½	1295	.....	.....	†479 87	887,769 43	40,143	3 48	140,051 35	51,318	3 26	167,505 18	63,143	2 88	182,193 40
MIDDLESEX—Townships.																					
Monroe	124	124	.....	5	7	10	61	41	30 00	300 00	†100 00	53,320 00	865	3 50	3,027 50	689	3 75	2,583 75	3,200	3 50	11,200 00
ATLANTIC.—Townships.																					
Hammonton	492	307	185	...	.....	.....	58	434	15 00	290 00	†60 00	13,380 00	2,456	3 50	8,596 00	2,042	3 50	7,247 00	2,190	3 00	6,570 00
CAMDEN.—Townships.																					
Waterford	130	65	65	...	.....	10	30	90	.....	.....	†265 00	34,450 00	.....	.....	.....	100	3 50	350 00	300	3 00	900 00
SUMMARY OF COUNTIES.																					
Ocean	*340 1849½	1625½	564	...	148½	137½	268½	1295	.....	.....	479 87	887,769 43	40,143	3 48	140,051 35	51,318	3 26	167,505 18	63,143	2 88	182,193 40
Middlesex	124	124	.....	5	7	10	61	41	.....	.....	430 00	53,320 00	865	3 50	3,027 50	689	3 75	2,583 75	3,200	3 50	11,200 00
Atlantic	492	307	185	...	.....	.....	58	434	.....	.....	365 00	130,380 00	2,456	3 50	8,596 00	2,042	3 50	7,247 00	2,190	3 00	6,570 00
Burlington	2131½	1092	1039½	113	313	251½	293	1161	.....	.....	217 51	463,525 80	14,675	3 23	47,538 75	32,173	3 14	101,074 00	39,194	2 98	116,893 80
Monmouth	242	210	32	38	1	19	83	101	.....	.....	383 05	92,700 00	700	3 50	2,450 00	7,000	3 00	21,000 00	8,382	2 78	23,368 68
Camden and Atlantic	130	65	65	...	.....	10	30	90	.....	.....	265 00	34,450 00	.....	.....	.....	100	3 50	350 00	300	3 00	900 00
Totals and averages	4969	3423½	1885½	156	469½	428	793½	3122	.....	.....	†334 50	$1662145 23	58,839	$3 42	$201663 60	93,332	$3 21	$299,759 93	116409	$2 93	$341,125 08

Total market value 1873, $341,125.08. Less expense picking, marketing, etc., $1.00 per bushel, $116,409.00. Net income, $224,716.08. This is 13½ per cent. on entire investment.

* Natural, on which no investment cost is calculated.

† Total average cost per acre three years from planting.

Mr. French's Report, Continued.

The value and need of reliable statistical information is increasingly felt in every department of production and trade.

Natural conditions localize the culture of cranberries, and render statistical knowledge comparatively easy of attainment. I therefore willingly undertook the work assigned me, promising to do the best I could with the leisure at my command.

Like most undertakings, I have found the labor and the outlay greater than was expected, and must confess a greater lack of completeness than I had hoped. In no instance of personal interview have I failed of an apparently candid and truthful response to my inquiries.

I have made systematic record of the details obtained, so that errors may be easily discovered and corrected. Most of the facts admit of tabulation, and are presented in that form, showing results by townships, by counties, and for the entire State. The average of prices per bushel and of cost per acre are obtained by dividing footings by the number of lots represented therein, which, though not mathematically accurate, is thought near enough for practical purposes. The labor of strict calculations was greater than I could command time to accomplish.

Cranberry growing is comparatively a new interest. The conditions of assured success have been very imperfectly understood. A full crop, any time during the last ten years, has yielded a very large per centage upon the capital invested—sometimes reaching, in individual cases, 100 per cent. The stimulus of these exceptional profits has induced much injudicious planting, and, consequently, much disappointment and loss.

The acreage in vines and the crops produced, are believed to be underrated in the tables. Some bogs have, no doubt, been overlooked, and some points I have been unable to reach or to get information therefrom. Probably an addition of five per cent. to the acreage and to the crop of 1873; ten per cent. to the crop of 1872, and fifteen per cent. to the crop of 1871, would more nearly represent the actual facts. As we recede from the present, individual records are more fragmentary, and recollections more uncertain, or wholly at fault.

The number of individuals and firms growing cranberries in the State, according to my record, is three hundred and ten; and there are fourteen joint stock companies.

I trust a good statistical beginning has been made, and that the work may be perfected and enlarged. The next and most important step is to obtain accurate and prompt statistics of the present crop. To this end I suggest the appointment, or rather the engagement, of persons in each cranberry centre, who will agree to ascertain and forward, without delay, the actual amount of fruit gathered, say on

the 25th of September, in their respective districts; and at the close of the season, say October 15th, in like manner a statement of the entire crop gathered. Arrangements should also be made for recording the arrivals of the fruit in market, so that the passage of the fruit from the first hands may be known, and have its due weight in the determination of prices and sales.

N. R. French.

[*From "Cranberry Supplement" of Bricksburg Times and Journal, December 5th*, 1875.]

THE BANKED MEADOWS OF SALEM COUNTY, N. J.

BY DAVID PETIT.

John Fenwick settled and laid out, in the year 1675, the town of "New Salem," (so called.) In the year 1676, the 25th of the 4th month, he gave a lot of town-marsh, so called, lying adjacent to Salem, for pasture, to each one who purchased a town lot of sixteen acres. In the year 1685 this town-marsh, numbering 560 acres, was surveyed by order of the Surveyor General; consequently it must have been then reclaimed from the tides by banks and sluices.

This is the earliest record I have found of any of these marshes being reclaimed from the tides, and is, perhaps, the earliest of any in this country. This banking must have been a success then, for soon after, other companies were formed, and more and more of these marshes were reclaimed, and before the year 1750, banking these tide-marshes became general. There are now about 16,000 acres of such marshes reclaimed in Salem county.

These banked meadows are rich in fine deposit from muddy tide-waters, which has accumulated in immense quantities on the low-lands in this county, and varies in depth from a few inches or a foot, to ten, twenty, thirty, forty, and even sixty feet. They are generally richest near the surface, or a few feet down. In dredging a water-course up Mannington Meadow, a few years ago, three miles long and nine feet deep, poor mud was reached in only two points. The material of these deposits is dark, about the color, and of about the texture of the richest prairie sod in Kansas and Nebraska. Where this land is well drained and properly cultivated, it produces as much wheat and corn to the acre, and much more grass, than the best prairie land west—even in Brown county, Kansas, said to be the richest in the State. I witnessed the crops growing in that county the last two years, when in their most flourishing condition. Owing to the peculiar texture of this land when broken and pulverized—that of becoming very loose—

it requires a different mode of farming from some other lands, to insure success. *Very* shallow plowing of these banked meadows answers a better purpose than deeper, because the roots of our field-crops run naturally near the surface, and by plowing shallow, so as to leave a hard pan near these, the roots can get a better hold, and will grow better than if plowed and pulverized deeper. If the land is plowed and pulverized deep, it should be rolled hard after seeding, to insure success. The want of rolling and early seeding are the principal causes of failure on such lands.

An application of one hundred bushels of slaked lime to the acre, once in from seven to ten years, is about all the land needs to keep up its fertility, even when used for farming purposes, though it will bear much more with increased benefit.

One of our farmers, a few years ago, reported to our club, that he raised three hundred and seventy bushels of wheat on ten acres, from liming alone, and another stated that he had cropped a lot alternately with corn and rye for eighteen years with success. He then applied one hundred bushels slaked lime to the acre and sowed wheat early. This he pastured close in the fall so as to pack the land, and gathered and thrashed, the next summer, forty-two bushels to the acre. Corn grows equally well, also grass, potatoes and vegetables.

There are two thousand acres or more of the poorer quality of these lands set in hard grass, producing from 40,000 to 60,000 bushels of seed annually, or from twenty to forty bushels to the acre. The hay, after the seed is thrashed off, makes but poor fodder, and is used principally to litter the barn-yard and spread on the upland.

The best of these meadows being too rich for herd-grass, they are appropriated to other purposes—grazing, raising grass for hay, and farming. Green grass has sometimes been cut and the seed saved, bringing a very high price per pound.

When these meadows remain in green grass, and sometimes other grasses, a long time, they become sod bound, and it is found best to plow them up, lime, and take off a course of crops before seeding down again. This course seems to thoroughly renovate the land.

The following is an average of the analysis of the material of these banked meadows from four localities in this county, as given by Professor G. H. Cook, in his Geological Report for 1868, viz.:

	Per cent.
Silica	60.62
Alumina	12.59
Peroxide of iron	4.84
Lime	.76
Magnesia	.64
Potash	1.32
Soda	.98
Chlorine	.17

	Per cent.
Sulphuric acid	.92
Phosphoric acid	.16
Organic matter and water	15.61
Hydroscopic moisture	2.15
	100.76

DAVID PETTIT,
Salem, N. J.

To Professor G. H. Cook, New Brunswick, New Jersey.

ON ROAD LAWS AND ROADS.

Inquiries have been made in different parts of the state in regard to the road laws under which most of the country roads are made and repaired. The following answers have been received:

J. T. Kern, Belvidere, Warren county, says, the road law in operation in this county is the general road law of the state.

John Crane, Union, Union county, and president of the "Union County Farmers' Club," writes: "I send you a copy of our road law; we have been working under this law for four years, and it gives us very general satisfaction. Our roads have been greatly improved."

Wm. S. Potter, Somerville, Somerset county, answers this question affirmatively.

Ferdinand T. Holcombe, Mount Airy, Hunterdon county, writes in reply: "No; a very bad one. Poor roads, and costs twice as much as ought to."

Henry E. Hale, Princeton, says: "We have a good road law in Princeton township, passed last winter. One man is appointed by the township committee supervisor of all the roads, with power to let out work to others under contract." The act for Princeton will be found at the end of this article.

Henry K. How, New Brunswick, writes: "We have a pretty good road law, but it needs to be enforced by inspectors of roads, who can sue the township committees, and indict the road masters for neglect of duty."

Mark H. Busby, Masonville, Burlington county, says of that part of the county, that the roads are kept up by supervisors appointed by the townships, and that this a "very poor plan."

Joseph Carter, Woodbury, Gloucester county, writes: "We operate under the general road law of 1846 and its supplements to 1857;

and besides that, in forming our (West Deptford) township, four years ago, we placed the roads and the overseers both under the control of the township committee, for the reason that we could not get good and capable men to accept the office of overseer of the roads, and again we have a resolution passed by our town meeting, that any one or more of our inhabitants who wish to improve or turnpike a certain piece of road, under the direction of the township committee may do so, and the township will be at one half of the expense; and at this time, I understand, in the lower part of the township, they are doing several miles of it, by claying a sandy road, under this resolution; and it seems to work well, but the subject of roads gives us more trouble than all other township matters combined."

David Petit, of Salem, says: "We have a road law to prevent stock from running at large, and our roads are good, and improving."

J. Morgan Barnes, of Woodstown, writes: "No special law, except Woolwich township, Gloucester county; that works very satisfactorily."

From F. S. Regensburg, Egg Harbor City: "A good road law would be very desirable, judging of the general condition of highways."

Ezra A. Osborn, Middletown, Monmouth county, writes: "Enclosed will find a copy of our new road law, which is operated in several districts of our township, and, as I understand, to the satisfaction of all concerned. The amount raised is generally one-fourth of one per cent. There is a marked improvement in the roads where the law is enforced. The extra tax is scarcely felt, the farmers doing the work required. If the same manner can be maintained for a few years we will soon have good roads (graded and graveled). The advantages to farmers and real estate owners cannot be over estimated. As Gillespie says: 'The roads of a country are true indications of the degree of its civilization.' I find there is quite a difference in the value of lands, whether located on a good, graded road or not. Twenty per cent. would be a low difference, and in many cases a great deal more. When property is for sale along a turnpike, there is always *a great display of that fact.* Where property is suited for suburban homes, good roads are the principal attraction. Landscape architects recommend location on well built roads, as it displays his art to better advantage. The advantages of well-built, graded roads to farmers are very easily estimated. A horse can draw three times as much on a smooth and hard road, say, twice as much on a graded and graveled road, hence can take in one load, what it takes in two on common roads. Therefore, to farms ten miles from market, it makes only five by this improvement."

The following is a partial list of Agricultural and Horticultural Societies in the State:

THE NEW JERSEY STATE AGRICULTURAL SOCIETY.

ORGANIZED, 1855.

President—Hon. Amos Clark, Jr., Elizabeth.
Recording Secretary—William M. Force, Newark.
Corresponding Secretary—P. T. Quinn, Newark.
Number of Members—350.
Capital invested in Fair Grounds, Buildings, &c., $90,000.

Meetings of the Directors are held on the third Wednesday in June, October, and January; annual meeting of the Society, on the third Wednesday in January.

Annual exhibition, at Waverly, Essex county, third week in September, which is very largely attended. An annual report of the meetings and the exhibition is published.

NEW JERSEY CRANBERRY GROWERS' ASSOCIATION.

ORGANIZED APRIL 25, 1873.

President—Rev. Dr. John H. Brakeley, Bordentown.

Vice Presidents—James A. Fenwick, New Lisbon; Dr. E. S. Merriman, Bricksburg.

Secretary and Treasurer—A. J. Rider, Trenton.

Executive Committee—Rev. Dr. J. H. Brakeley, Bordentown; A. J. Rider, Trenton; E. W. Crane, Caldwell; N. R. French, 180 Reade street, N. Y.

Representative in State Board of Agriculture—E. W. Crane, Caldwell.

Statistician—N. R. French, 180 Reade street, N. Y.

Corresponding County Secretaries—Ocean county, Julius Foster, Bricksburg; Burlington county, Theodore Budd, Pemberton; Atlantic county, George F. Miller, Hammonton; Monmouth county, Samuel Conover, Freehold; Middlesex county, F. L. Buckelew, Jamesburg;

Camden county, Job Braddock, Haddonfield; Cape May county, Thomas Beasley, Cape May Court House.

Number of Members—107.

The annual meetings are held at Trenton, on the third Wednesday in January; and annual conventions on the first Tuesday in September, at such place as designated at a previous meeting.

ATLANTIC COUNTY.

EGG HARBOR CITY AGRICULTURAL SOCIETY—ORGANIZED MARCH 23D, 1859.

President—Charles Kraus, Egg Harbor City.
Vice President—Philip Steigant, Egg Harbor City.
Recording Secretary—Valentine P. Hoffman, Egg Harbor City.
Treasurer—Charles Gruner, Egg Harbor City.
Number of Members—63.
Meetings—First and third Fridays in each month, at the Union Hotel, Egg Harbor City.
Annual Fair—Latter part of September.

A report of the last Fair of the Society, by F. S. Regensburg, will be found in the body of this report, under the head, "Report of the Exhibition of the Egg Harbor City Agricultural Society for 1874."

ATLANTIC COUNTY AGRICULTURAL ASSOCIATION—ORGANIZED, 1874.

BAKERSVILLE AGRICULTURAL CLUB.

FRUIT GROWERS' UNION, HAMMONTON*—ORGANIZED, 1868.

President—George F. Saxton, Hammonton.
Secretary—Gerry Valentine, Hammonton.
Other Officers—One Vice President and six Directors.
Number of Members—100.

* No report of officers and meetings received since last year's report.

BURLINGTON COUNTY.

BURLINGTON COUNTY AGRICULTURAL SOCIETY, ORGANIZED 1846.

President—Samuel Butterworth, Vincentown.
Vice Presidents—William R. Hancock, William M. Risdon, Josiah B. Pew, Clayton H. Dudley.
Recording Secretary—John B. Collins, Mount Holly.
Corresponding Secretary—James Lippincott, Mount Holly.
Treasurer—Edward B. Jones, Mount Holly.
Number of Members—(stockholders)—400.

Meetings—in the Burlington County Lyceum rooms, quarterly, viz.: on the fourth Saturday in January, April, July, and October.
Annual Exhibitions—generally the first Tuesday and Wednesday of October.

BURLINGTON COUNTY FARMERS' CLUB, ORGANIZED IN 1871.

President—James Lippincott, Mount Holly.
Vice Presidents—Clayton Zelley, Joseph W. Emley, James Logan.
Secretary—Henry I. Budd, Mount Holly.
Treasurer—Edward L. Bowne.
Number of Members—80.

The meetings have been irregular on account of the absorption of members in the granges, a list of which follows this list of agricultural and horticultural societies. An article "on Breeding and Fattening Hogs," by the secretary, H. I. Budd, will be found in the body of this report. Also, one on the same subject by Isaac Fennimore, of Lumberton.

PROGRESSIVE FARMERS' CLUB OF BURLINGTON COUNTY, ORGANIZED DECEMBER, 1865.

President—William Dunn Rogers, Mount Laurel.
Recording Secretary—Henry C. Herr, Hainesport.
Corresponding Secretary and Treasurer—Mark H. Busby, Masonville.

Meetings—First Monday in each month, at Mount Laurel.
Number of Members—110.

CAMDEN COUNTY.

FARMERS' MUTUAL BENEFIT ASSOCIATION—ORGANIZED JANUARY, 1872.

President—Joseph C. Hollingshead, Haddonfield.
Vice President—Ezra C. Bell.
Recording Secretary—R. Lewis Shivers.
Corresponding Secretary—Edward Burrough, Merchantville.
Treasurer and Librarian—J. Stokes Coles.
Number of Members—35.

Meetings are held regularly, on the last Thursday of each month.

CAPE MAY COUNTY.

CAPE MAY COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED MARCH, 1870.

President—George H. Dare, Seaville.
Secretary—E. F. Westcott, South Seaville.

The annual exhibition is held the last Saturday in February, and an exhibition in September.

CAPE MAY AGRICULTURAL SOCIETY—ORGANIZED APRIL, 1870.

President—Dr. John Wiley, Cape May Court House.
Secretary—John Spaulding, Cape May Court House.
Treasurer—Coleman F. Leaming.
Number of Members—50.

Meetings are held in April and July, and an exhibition in September or October.

CUMBERLAND COUNTY.

CUMBERLAND COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY*—ORGANIZED DECEMBER 8, 1851

President—Charles Woodnutt, Bridgeton.
Vice Presidents—John Bonham, David McBride, David S. Gilman, A. R. Jones.
Secretary—Francis Danzenbaker, Bridgeton.
Number of Members—485.

A meeting is held on the fourth Wednesday in January, and an exhibition in September of each year.

VINELAND AGRICULTURAL SOCIETY*—ORGANIZED OCTOBER, 1862.

President—Nelson Roberts, Vineland.
Recording Secretary—Richard Lush, Vineland.
Corresponding Secretary—Prof. ——— York, Vineland.
Treasurer—G. Wright, Vineland.
Librarian—William Jolly, Vineland.
Number of Members—75.

Meetings are held every Saturday evening; and an agricultural, horticultural, and floricultural fair is held annually.

FLORAL SOCIETY OF VINELAND—ORGANIZED 1864–5.

President—Mrs. O. D. Graves, Vineland.
Vice President—Mrs. C. D. Bailey, Vineland.
Secretary—Mrs. L. D. Dyer, Vineland.
Treasurer—Mrs. W. P. Swasey, Vineland.
Number of Members—200.

Meetings, weekly. The society is strictly floral, but it unites with the Vineland Agricultural Society in their annual exhibition. A chrysanthemum show is held in the fall of each year.

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* No reports of officers, meetings, &c., received since last annual report.

GLOUCESTER COUNTY.

WOODBURY FARMERS' CLUB.

President—Joseph Carter, Woodbury.
Vice President—Daniel J. Packer, Woodbury.
Secretary—Charles W. Knight, Woodbury.
Corresponding Secretary—D. Cooper Andrews, Woodbury.
Treasurer—James Budd, Woodbury.
Number of Members—30.

The meetings have been suspended for some time.

HUNTERDON COUNTY.

HUNTERDON COUNTY AGRICULTURAL SOCIETY*—ORGANIZED FEBRUARY 16, 1856.

President—John C. Hopewell, Flemington.
Vice Presidents—Caleb F. Fisher, George F. Crater.
Recording Secretary—John L. Jones, Flemington.
Corresponding Secretary—Richard S. Kuhl, Flemington.
Number of Members—About 350.

Meetings of stockholders are held on the third Saturday of February, and an exhibition on the Tuesday, Wednesday, and Thursday of the last week in September.

UNION FARMERS' CLUB, MOUNT AIRY.

President—Elisha E. Holcombe, Lambertville.
Vice President—Newton K. Young.
Secretary—F. S. Holcombe.
Treasurer—Gideon M. Brewer.
Number of Members—26.

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*No reports of officers and meetings received since the publication of the last annual report of this Board.

MERCER COUNTY.

THE FARMERS' ASSOCIATION OF PRINCETON—ORGANIZED IN 1840.

President—Hon. Charles S. Olden, Princeton.
Vice President—Ralph Guild, Princeton.
Secretary—Henry E. Hale, Princeton.
Number of Members—Limited to 20.

Meetings are held once a month, at the houses of the members.

HOPEWELL FARMERS' CLUB*—ORGANIZED DECEMBER 19, 1868.

President—Ralph Ege, Hopewell.
Vice President—Joseph M. Phillips, Hopewell.
Secretary—John M. Dalrymple, Hopewell.
Treasurer—William I. Phillips.
Number of Members—18.

Meetings are held on the first and third Wednesdays of each month.

MIDDLESEX COUNTY.

MIDDLESEX COUNTY FARMERS' CLUB—ORGANIZED NOV. 12, 1867.

President—James Neilson, New Brunswick.
Vice President—L. E. Rice, Rahway.
Recording Secretary—George H. Lambert, New Brunswick.
Corresponding Secretary—Henry K. How, New Brunswick.
Treasurer—Dr. A. D. Newell, New Brunswick.
Number of Members—75.

Meetings are held the first Monday of each month.

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*No report of officers and meetings received this year.

MONMOUTH COUNTY.

MONMOUTH COUNTY AGRICULTURAL SOCIETY.

President—Nathaniel S. Rue, Fillmore.
Vice Presidents—Daniel Conover, Marlborough; Joseph H. Holmes, Holmdel.
Cor. Secretary—John C. Smock, Freehold.
Rec. Secretary—J. J. Conover, "
Treasurer—C. A. Bennett, "
Number of Members—300.

Meetings are held on the third Tuesday in January, and at the time of Exhibition, in September.
Annual Exhibition—Second week in September.

MONMOUTH COUNTY FARMERS' CLUB, ORGANIZED FEBRUARY 18, 1869.

President—John S. Whitlock, Matawan.
Vice President—Henry Schanck, Freehold.
Secretary—S. E. Thompson, Freehold.
Treasurer—John Dorrance, Freehold.
Number of Members—79.

Meetings are held, at Freehold, on the first Tuesday in January, February, March, June, September, and December.

MONMOUTH COUNTY POULTRY ASSOCIATION, ORGANIZED IN 1873.

President—John Van Mater, Colts Neck.
Secretary—John T. Rosell, Freehold.
Treasurer—D. A. Vanderveer, Manalapan.

Meetings are held quarterly at Freehold, at which essays on poultry are read. An exhibition is held annually, at Freehold, either in December or January. These have attracted much attention and have done much to improve the stock of poultry in the country. They are open to competitors from all parts of the world.

OCEAN COUNTY.

OCEAN COUNTY AGRICULTURAL SOCIETY.*

President—Geo. W. Cowperthwait, Toms River.
Secretary—J. W. Carmichael, Toms River.

SALEM COUNTY.

WEST JERSEY AGRICULTURAL AND HORTICULTURAL ASSOCIATION OF THE COUNTIES OF SALEM AND GLOUCESTER, NEW JERSEY.

President—Omar Borton, Woodstown.
Vice Presidents—John W. Dickinson, Woodstown; Robert Vanmeter, Pittsgrove; D. M. J. Paulding, Daretown; Isaac Scull, Woodstown.
Secretary—J. Morgan Barnes, Woodstown.
Treasurer—Dr. L. A. D. Allen, Woodstown.
Number of Members—264.

Meetings—The annual meeting is on the third Thursday in January, and a semi-annnal meeting, third Thursday of July, at Woodstown.
The next annual exhibition will be September 15th and 16th, 1875.

SALEM COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY,* ORGANIZED 1850.

President—R. M. Acton, Salem.
Secretary—David Petit, Salem.

SOMERSET COUNTY.

SOMERSET COUNTY FARMERS' AND MANUFACTURERS' ASSOCIATION—ORGANIZED JULY 16, 1870.

President—Rynier H. Veghte, Somerville.
Vice President—John C. Kenyon.

* No report received this year.

Secretary—William S. Potter, Somerville.
Treasurer—L. R. Vredenburg, Somerville.
Number of stockholders—About 600.

The annual meeting of stockholders is held on the third Tuesday of February. The annual fair of the society is held in the first week in October.

UNION COUNTY.

UNION COUNTY FARMERS' CLUB—ORGANIZED DECEMBER 11, 1868.

President—John Crane, Union.
Vice Presidents—Lewis H. Wade, E. P. Beebe, Benj. W. Tucker.
Secretary—Dennis C. Crane, Roselle.
Treasurer—Ogden Woodruff.
Number of Members—35.

Meetings are held in the Court House, Elizabeth, semi-monthly. excepting in the summer. They are informal in character, and the discussions relate to general farm questions. Agricultural papers are taken, and the club has a library.

WARREN COUNTY.

WARREN COUNTY FARMERS', MECHANICS', AND MANUFACTURERS' ASSOCIATION—ORGANIZED, 1859.

President—John V. Deshong, Belvidere.
Secretary—J. T. Kern, Belvidere.
Treasurer—Israel Harris, Belvidere.
Number of Members—60.

The annual meeting is held at Belvidere, the last Friday in December. The annual exhibition takes place at Belvidere on the first Tuesday in October.

The interest in our Agricultural Societies and Farmers' Clubs has, to a considerable extent, been transferred to the Farmers' Granges, which have been organized in many parts of the State. The following list of granges and officers has been sent to the Board by Henry I. Budd, Esq., of Mount Holly:

OFFICERS OF THE NEW JERSEY STATE GRANGE.

MASTER	Mortimer Whitehead	Middlebush, Somerset county.
Overseer	Jacob M. Harris	Roadstown, Cumberland county.
Lecturer	William C. Kates	Woodstown, Salem county.
Steward	William S. Taylor	Burlington, Burlington county.
Assistant Steward	Joel Horner	Merchantville, Camden county.
Chaplain	Rev. Edward Wilson	Metuchin, Middlesex county.
Treasurer	Chalkley A. Rulon	Swedesboro, Gloucester county.
Secretary	Russell W. Pratt	Newfield, Gloucester county.
Gate Keeper	Elisha E. Holcombe	Lambertville, Hunterdon county.
Ceres	Mrs. Maye Whitehead	Middlebush, Somerset county.
Pomona	Mrs. Mary G. Duell	Wenonah, Gloucester county.
Flora	Mrs. Anna P. Ridgeway	Hancock's Bridge, Salem county.
L. A. S.	Mrs. Hannah C. Holcombe	Lambertville, Hunterdon county.

EXECUTIVE COMMITTEE.

Mortimer Whitehead	Middlebush, Somerset county.	Sylvester Slater	Lafayette, Sussex county.
Charles Woodnut	Shiloh, Cumberland county.	James Lippincott	Mt. Holly, Burlington county.
John W. Dickinson	Woodstown, Salem county.	Isaac W. Nicholson	Camden, Camden county.

STATE PURCHASING AGENT—Job Griscom, No. 101 Vine street, Philadelphia, Pa.

SUBORDINATE GRANGES IN NEW JERSEY.

No.	NAME.	MASTER.	MASTER'S ADDRESS.	SECRETARY.	SECRETARY'S ADDRESS.	LECTURER.	LECTURER'S ADDRESS.
1	Pioneer Grange	Zenas Henderson	Stelton, Middlesex Co	G. W. Thompson	Stelton, Middlesex Co	J. W. Pennington	New Brunswick, Middlesex Co
2	Marl Ridge	F. S. Gaskill	New Egypt, Ocean Co	Thos. B. Jobes	New Egypt, Ocean Co	Joseph C. Nutt	
3	Hammonton	R. J. Byrnes	Hammonton, Atlantic Co	E. J. Woolley	Hammonton, Atlantic Co	Mrs. M. Howland	Hammonton, Atlantic Co.
5	Swedesboro	Joseph R. Black	Swedesboro, Gloucester Co	John T. Howey	Swedesboro, Gloucester Co	Jeremiah Adams	Swedesboro, Gloucester Co.
6	Mt. Laurel	Japhet B. Joyce	Moorestown, Burlington Co	Howard Darnell	Mt. Laurel, Burlington Co	Edward Darnell	Marlton, Burlington Co.
7	Somerset	Peter J. Staats	Boundbrook, Somerset Co	M. Whitehead	Middlebush, Somerset Co	J. Wake	Middlebush, Somerset Co.
8	Moorestown	Wm. R. Lippincott	Cinnaminson, Burlington Co	F. Garrigues	Moorestown, Burlington Co	John S. Collins	Moorestown, Burlington Co.
9	Woodstown	Wm. C. Kates	Woodstown, Salem Co	Bichman Coles	Harrisonville, Gloucester Co	J. W. Pancoast	Sharpstown, Salem Co.
10	Paulsboro	Geo. H. Gaunt	Paulsboro, Gloucester Co	Edward G. Miller	Paulsboro, Gloucester Co	James Budd	Paulsboro, Gloucester Co.
11	Vineland	Horace K. Flint	Vineland, Cumberland Co	J. P. Gage	Vineland, Cumberland Co	Joseph Mason	Vineland, Cumberland Co.
12	Ringoes	Elisha E. Holcombe	Lambertville, Hunterdon Co	F. S. Holcombe	Lambertville, Hunterdon Co	Jonathan A. Hunt	Ringoes, Hunterdon Co.
13	Cobansey	Jacob M. Harris	Roadstown, Cumberland Co	Eli E. Rogers	Bridgeton, Cumberland Co	Charles E. Hunt	Bridgeton, Cumberland Co.
14	Edgewood	Wm. S. Taylor	Burlington, Burlington Co	John L. Deacon	Burlington, Burlington Co	Edmund Cook	Burlington, Burlington Co.
15	Newfield	R. W. Pratt	Newfield, Gloucester Co	A. W. Page	Newfield, Gloucester Co	A. M. J. M. Page	Newfield, Gloucester Co.
16	Hopewell	Robert More	Bridgeton, Cumberland Co	J. C. Bowen	Shiloh, Cumberland Co	Chas. Woodnutt	Shiloh, Cumberland Co.
17	Harmony	C. P. Steward	Cohansey, Cumberland Co	Louis Schaible	Cohansey, Cumberland Co	A. J. Long	Cohansey, Cumberland Co.
18	Cumberland	G. W. Sheppard	Greenwich, Cumberland Co	R. P. Ewing	Greenwich, Cumberland Co	Charles Tyler	Greenwich, Cumberland Co.
19	Progress	Nathaniel Munday	Orange, Essex Co	Mrs. L. D. Hopping	Elizabeth, Union Co		
20	Fenwick	W. B. Ridgway	Hancock's Bridge, Salem Co	Joseph B. Anderson	Hancock's Bridge, Salem Co	S. C. Pancoast	Hancock's Bridge, Salem Co.
21	Seaville	Michael Swing	Seaville, Cape May Co	Wm. Doolittle	Oceanview, Cape May Co	P. M. Way	Oceanview, Cape May Co.
22	Harlingen	John J. Brokaw	Plainville, Somerset county	A. S. Hageman	Harlingen, Somerset Co	James Opie	Harlingen, Somerset Co.
23	Frankford	Jacob A. Courson	Branchville, Sussex Co	L. H. S. Martin	Augusta, Sussex Co	Squire Dalrymple	Branchville, Sussex Co.
24	Union	Edwin J. Osler	Merchantville, Camden Co	J. D. Janney, M. D.	Cinnaminson, Burlington Co	Joel Horner	Merchantville, Camden Co.
25	Mannington	A.M.PV.H.Dickins'n	Salem, Salem Co				
26	Harrisonville	Samuel Moore	Harrisonville, Gloucester Co	Edwin Starn	Harrisonville, Gloucester Co	John A. Flitcroft	Harrisonville, Gloucester Co.
27	Elsinboro	Samuel Powell	Salem, Salem Co	R. M. Acton, Jr.	Salem, Salem Co		
28	Stoe Creek	Isaac W. Elwell	Roadstown, Cumberland Co	E. Mulford	Roadstown, Cumberland Co		
29	Pittsgrove	Henry Combs	Daretown, Salem Co	C. F. H. Gray	Pittsgrove, Salem Co	J. L. Sumerill	Daretown, Salem Co.
30	Franklin	H. Lawrence	Daretown, Salem Co	N. R. N. Emmell	Daretown, Salem Co	E. L. Sheppard	Daretown, Salem Co.
31	Alloway	Chas. S. Ayars	Allowaystown, Salem Co	Daniel P. Dorrell	Allowaystown, Salem Co		
32	Bridgeport	S. B. Gaskill	Bridgeport, Gloucester Co	Charles G. Burk	Bridgeport, Gloucester Co	Joseph Cahaley	Bridgeport, Gloucester Co.

SUBORDINATE GRANGES IN NEW JERSEY.—Continued.

No.	NAME.	MASTER.	MASTER'S ADDRESS.	SECRETARY.	SECRETARY'S ADDRESS.	LECTURER.	LECTURER'S ADDRESS.
33	Lafayette	Sylvester Slater	Lafayette, Sussex Co	Raymond Snyder	Lafayette, Sussex Co		
34	Cedarville	Josias M. Cobb	Cedarville, Cumberland Co	John Rainier	Fairton, Cumberland Co	Smith Davis	Fairton, Cumberland Co.
35	Quinton	R. B. Griscom	Quinton, Salem Co	R. M. DuBois	Salem, Salem Co	Josiah S. Harris	Quinton, Salem Co.
36	Medford	David T. Haines	Medford, Burlington Co	Richard Haines	Medford, Burlington Co	Isaac Nicholson	Medford, Burlington Co.
37	Mt. Holly	James Logan	Mt. Holly, Burlington Co	Henry I. Budd	Mt. Holly, Burlington Co	Geo. E. Gaskill	Mt. Holly, Burlington Co.
38	Haddon	I. W. Nicholson	Camden, Camden Co	Geo. T. Haines	Haddonfield, Camden Co	Edw. Burrough	Merchantville, Camden Co.
39	Mantua	Chalkley Duell	Wenonah, Gloucester Co	Wm. C. Long	Mantua, Gloucester Co	W. H. Somers	Mantua, Gloucester Co.
40	Lawrence	Geo. W. Johnston	Trenton, Mercer Co	Isaac B. Baker	Lawrence Station, Mercer Co.	Franklin Dye	Trenton, Mercer Co.
41	Auburn	Geo. Lippincott	Auburn, Salem Co	Asa G. Turner	Auburn, Salem Co	E. W. Lippincott	Auburn, Salem Co.
42	Pennsgrove	Wm. Lawrence	Pennsgrove, Salem Co	Charles Leap	Pennsgrove, Salem Co	Joseph Diver	Pennsgrove, Salem Co.
43	Hope	E. Sheppard Wallen	Bridgeton, Cumberland Co	E. F. Cook	Bridgeton, Cumberland Co	David Padgett	Bridgeton, Cumberland Co.
44	Branchburg	Wm. J. Dilts	N. Branch Depot, Somerset Co.	Peter Dumont	N. Branch Depot, Somerset Co.	John S. Vorhees	W. House Depot, Hunterd'n Co.
45	Marlton	Joseph Atkinson	Marlton, Burlington Co	B. P. Wills	Marlton, Burlington Co	Thomas Wills	Marlton, Burlington Co.
46	Pedricktown	Samuel M. Hunt	Pedricktown, Salem Co	S. M. Layman	Pedricktown, Salem Co	Edward Urion	Pedrickton, Salem Co.
47	Hamburgh	Not known					
48	Elwood	David U. Brown	Elwood, Atlantic Co	Mrs. M. A. Brown	Elwood, Atlantic Co	Henry Park	Elwood, Atlantic Co.
49	Rancocas	Joseph Lundy	Rancocas, Burlington Co	J. B. Hillyard	Rancocas, Burlington Co	George Williams	Rancocas, Burlington Co.
50	Pemberton	Joseph L. Budd	Pemberton, Burlington Co	Frank Earl	Pemberton, Burlington Co	Jacob Grigg, M. D	Pemberton, Burlington Co.
51	Mullica Hill	John J. Dunlap	Mullica Hill, Gloucester Co	Frank Iszard	Mullica Hill, Gloucester Co	Geo. R. Hazelton	Mullica Hill, Gloucester Co.
52	Deerfield	Chas. H. Mickle	Deerfield, Cumberland Co	Joseph D. Cole	Deerfield, Cumberland Co	Henry Ott	Deerfield, Cumberland Co.
53	Pleasant Grove	John S. Woodruff	Bridgeton, Cumberland Co	Joseph L. Brooks	Finley Station, Cumberland Co.	E. S. Woodruff	Bridgeton, Cumberland Co.
54	Palatine	William Overs	Elmer, Salem Co	R. M. Hitchner	Elmer, Salem Co		
55	Mutual	Parent Sharp	Mauricetown, Cumberland Co.	Robt. Shropshire	Mauricetown, Cumberland Co.		
56	Readington	John Runyon	Readington, Hunterdon Co	James Lane	Readington, Hunterdon Co		
57	Centre Grove	R. G. Brandriff	Millville (box 305,) Cumb. Co	John W. Earl	Millville (box 305,) Cumb. Co	Daniel Earl	Millville, Cumberland Co.
58	Columbus	Chas. W. Reeve	Columbus, Burlington Co	F. S. Kelley	Jacksonville, Burlington Co	Aaron S. Robins	Jacksonville, Burlington Co.
59	Woodbury	Samuel H. Ladd	Woodbury, Gloucester Co	Casper Budd	Woodbury, Gloucester Co	Joseph Carter	Woodbury, Gloucester Co.
60	Course's Landing	Clarkson Lippincott	Sharpstown, Salem Co	Thos. Stewart	Sharpstown, Salem Co		
61	Crosswicks	A. F. Satterthwait	Crosswicks, Burlington Co	J. S. Middleton	Crosswicks, Burlington Co	D. Satterthwait	Crosswicks, Burlington Co.
62	Concord	A. J. Smith	Franklinville, Gloucester Co	J. P. Langley	Franklinville, Gloucester Co	Wm. Langley	Franklinville, Gloucester Co.
63	Five Points	John S. Rulon	Five Points, Gloucester Co	F. H. Heritage	Five Points, Gloucester Co	Wm. N. Justice	Five Points, Gloucester Co.
64	Pennington	S. B. Ketcham	Pennington, Mercer Co	N. M. Lewis	Pennington, Mercer Co	Ira Stout	Pennington, Mercer Co.
66	Millville	A. E. Burcham	Millville, Cumberland Co	Miss Anna Clunn	Millville, Cumberland Co	Wm. E. Clunn	Millville, Cumberland Co.
67	Vincentown	J. J. Rogers	Buddtown, Burlington Co	Alfred Budd	Vincentown, Burlington Co	S. Woolston, M. D	Vincentown, Burlington Co.
68	Unionville	John J. Coombs	Unionville, Gloucester Co	Thos. Iszard	Clayton, Gloucester Co	Jacob Heritage	Unionville, Gloucester Co.
69	Glassboro	John Repp	Glassboro, Gloucester Co	S. H. Stranger, Jr	Glassboro, Gloucester Co	C. Simmerman	Glassboro, Gloucester Co.
70	Newport	Sol. Chambers	Newport, Cumberland Co	R. H. Leaming	Newport, Cumberland Co	Isaac H. Joslin	Newport, Cumberland Co.
71	South Branch	Not known					
72	Sandyston	Elias N. Roe	Bevans, Sussex Co	John Youngs	Bevans, Sussex Co		
73	Ewing	James B. Green	Greensburg, Mercer Co	Chas. H. Walker	Greensburg, Mercer Co		
74	Mt. Pleasant	Daniel R. Hill	Mt. Pleasant, Hunterdon Co	John Hackett	Mt. Pleasant, Hunterdon Co	D. H. Ammerman	Mt. Pleasant, Hunterdon Co.
75	Forest Grove	Charles Young	Forest Grove, Gloucester Co	Mrs. V. H. Porter	Forest Grove, Gloucester Co	I. W. Porter	Forest Grove, Gloucester Co.
76	Milford	J. W. Bloom	Milford, Hunterdon Co	Josiah Clark	Milford, Hunterdon Co	C. A. Robinson	Frenchtown, Hunterdon Co.
77	Mercer	Ralph Ege	Hopewell, Mercer Co	W. S. Phillips	Hopewell, Mercer Co	John L. Ganty	Mount Rose, Mercer Co.
78	Wantage	A. B. Wilson	Deckertown, Sussex Co	J. W. McCoy	Deckertown, Sussex Co	Wm. Litsworth	Deckertown, Sussex Co.
79	Hamilton	James C. Robbins	Hamilton Square, Mercer Co	Azariah Cubberly	Hamilton Square, Mercer Co	Theo. Cubberly	Hamilton Square, Mercer Co.
80	Flemington	Geo. B. Stothoff	Flemington, Hunterdon Co	J. C. Britton	Flemington, Hunterdon Co	Theo. R. Young	Flemington, Hunterdon Co.
81	Friesburg	Calvin Dilks	Allowaystown, Salem Co	W. R. Lawrence	Cohansey, Cumberland Co	H. C. Perry	Allowaystown, Salem Co.
82	Walpack	Isaac S. Rundle	Walpack Centre, Sussex Co	John H. Wood	Walpack Centre, Sussex Co	Charles Haney	Walpack Centre, Sussex Co.
83	Andover	Wm. M. Iliff	Andover, Sussex Co	T. F. Youngs	Andover, Sussex Co		
84	Bethel	J. C. Thompson	Hurffville, Gloucester Co	Geo. W. Grier	Hurffville, Gloucester Co		
85	Williamstown	John M. Taggar.t	Williamstown, Gloucester Co	Joseph J. Ayars	Williamstown, Gloucester Co		

CONTENTS.

THIRD ANNUAL REPORT

OF THE

NEW JERSEY

STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1875.

TRENTON, N. J.:
PUBLIC OPINION—WILLIAM S. SHARP, BOOK AND JOB PRINTER.

1875.

OFFICERS OF THE BOARD.

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SECRETARY:

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GEORGE H. COOK.....*New Brunswick.*

*Deceased.

REPORT.

To the Legislature of the State of New Jersey, in Senate and General Assembly convened:

The State Board of Agriculture herewith submit their third annual report, upon the subjects committed to their charge, in the act for organizing the Board, which was passed April 4th, 1873.

The business depression throughout our country has affected farmers. Prices of produce have been low; and, for many articles, the demand has not been brisk. For those who are in debt, this has necessarily caused much discouragement and loss, but for those free from mortgages or other burdensome liabilities, there has been less distress than in most other callings.

The winter of 1874–5 was unusually severe and trying for wheat and old meadows. For several weeks in the latter part of winter, the ground was covered with hard, firm ice, which killed grain and grass roots, and the crops of wheat and hay were much shortened from this cause. Oats grew well, and were more than an average crop; but in some parts of the state they were much damaged by frequent and heavy rains at the time of harvest.

The season was, altogether, favorable for corn and potatoes, and no better average crops of these staples have been known for many years. Losses from unfavorable seasons and bad weather must always be expected for some one or other of the farm crops; but, as tillage is improved, drainage made better, and the soil enriched more highly, these losses are less felt. In fact, they seem to be no more on good land than on poor land; that is, a field which would yield twenty-five bushels of corn per acre, might be damaged by drought, so as to yield nothing; while another field yielding seventy-five bushels of corn per acre, might be damaged by drought to the amount of twenty-five bushels per acre, and still yield fifty bushels per acre, which is a paying crop, instead of a dead loss. Something like this is believed to hold throughout in regard to the losses in crops grown on good and poor farm lands.

It is difficult to make comparisons, in regard to the progress of

agriculture, from year to year, on account of the variations in the weather, and in the general business of the country; but, by taking longer intervals, as periods of ten or twenty years, there is no difficulty in seeing that the average crops grown on our soils are much larger than they were formerly; and, also, that the business of farming, with our advantages of soil, climate, and convenient markets, must continue to prosper and extend.

ANALYSES OF COMMERCIAL FERTILIZERS.

Much work has been done the past year in testing and analyzing fertilizers. Some of this was for manufacturers and dealers in fertilizers, and some for the experiments on the college farm.

The results are shown in the analyses here published, and in some of the statements of experiments. There cannot be less than $300,000 worth of high priced commercial fertilizers used in New Jersey every year, and competent judges put the estimate at double that sum. These fertilizers vary wonderfully in their composition, and their adaptability to different crops, as well in their purity. The analyses will enable the observing farmer to find out what constituents are necessary for his crops, and will help to protect him from fraud. The losses from ignorance and fraud, in regard to the composition of commercial manures, are enormous. A better appreciation of the value of analyses is becoming prevalent with our farmers. Francis Danzenbaker, esq., of Bridgeton, writes: "There is a growing confidence with our farmers in the analyses of fertilizers, and there can be no doubt but that it is a great protection to them, and they will realize it more and more every year. The dealers are very bitter against it, as it compels them to show the real merit of their stock for sale." Some fertilizers are still sold without any analyses, but the amount is diminishing yearly.

There is, too, a growing habit among farmers of buying simple fertilizers, as sulphate of ammonia, nitrate of soda, plain super-phosphate of lime, muriate of potash, sulphate of potash, &c., and mixing them to suit their own circumstances, or using them separately. This habit should be cultivated, and when it is fully carried out, the farmer will be able to protect himself from fraud or loss in using unnecessary manures. George E. White, of 160 Front street, New York, and H. J. Baker, 215 Pearl street, New York, deal in such fertilizers, and have sent their price lists, and they can probably be bought of other respectable dealers in New York and Philadelphia.

The prices of fertilizers have not materially changed since last year, and therefore they are continued the same in the estimate, and are here inserted, together with the directions for computing the value of manures from their analyses.

VALUATION OF FERTILIZERS.

The value of commercial fertilizers is, by common consent, both in Europe and in America, calculated from their chemical components, which are ascertained by analysis. It is also allowed that ammonia, phosphoric acid and potash are the only constituents, in a fertilizer costing $15.00 or upwards, per ton, that shall ordinarily be taken into account.

Experience has proved that these three substances are powerful fertilizers, and that they can be profitably used by farmers. The price per pound at which each of them shall be rated, must be found from the lowest market rates of the commercial substances containing them. To establish prices for them, now, in the autumn of 1875, the following data may be taken as the basis, using the present wholesale prices in New York and Philadelphia.

Ammonia, can be got cheapest at the present time from sulphate of ammonia, which sells at five and a half cents per pound; or the equivalent of ammonia from nitrate of soda, which sells at three and three-quarter cents a pound.

Commercial sulphate of ammonia contains from twenty-five to twenty-nine per cent. of ammonia. A sample analyzed here, contained twenty-five per cent. and we may use this for the standard. The twenty-five pounds of ammonia in one hundred pounds of sul. ammonia, are then worth $5.50, or twenty-two cents per pound.

Nitrate of soda, of ninety-six per cent. purity, contains the equivalent of nineteen per cent. of ammonia. And nineteen pounds of ammonia in the one hundred pounds of nitrate soda is worth $3.75, or almost twenty cents per pound.

As nitrate of soda is not so well known in our country as sulphate of ammonia, it is safest to adopt the price derived from the latter, which is twenty-two cents.

Phosphoric acid in its soluble form, is cheapest in some of the super-phosphates made from phosphatic guano, or mineral phosphates. Such super-phosphates guaranteed to contain eleven per cent. of soluble phosphoric acid, can be bought for $25.00 per ton. The ton contains, at this rate, two hundred and twenty pounds of the phosphoric acid. As two hundred and twenty pounds cost $25.00, one pound costs almost eleven and a half cents.

Phosphoric acid in its reverted form is only this acid changed from the preceding; and is variable in quantity, and not intentionally for sale. As it is in the super-phosphates, and in many cases increases in quantity as the time they are kept lengthens, its price must be estimated from the experience of those who use it. Some farmers consider it quite equal to the soluble phosphoric acid; but it is usually considered to be a little less valuable. A price for it may be made at ten cents per pound.

Phosphoric acid in its insoluble form, as in animal bones may have a price made out from the rates at which bone dust is sold. Bone dust, containing twenty-nine per cent of phosphoric acid, and two per cent. of ammonia, can be bought for $35 a ton. The two per cent. of ammonia amounts to forty pounds in the ton. This ammonia is still in its elements, and should not be estimated at above fifteen cents a pound, or the whole at $6, which would reduce the cost of the phosphoric acid in the bone dust to $29. The ton contains five hundred and eighty pounds of it, and of course, if five hundred and eighty pounds are worth $29, one pound is worth five cents. And this may be taken as the standard price.

Potash can be purchased in the form of muriate of potash, at the lowest rates. That salt of potash is now selling at $2.75 per hundred, at eighty per cent. purity. It contains fifty per cent. of potash, which, of course, must be considered as being worth $2.75, or five and a half cents per pound.

PRICES.

Ammonia, per pound	22 cents.
Soluble phosphoric acid	11½ "
Reverted phosphoric acid	10 "
Insoluble phosphoric acid	5 "
Potash, soluble	5½ "

By the use of these prices, the value of any fertilizer of which an analysis is given can be calculated, remembering that the per centage of any constituent given in the analysis, if multiplied by twenty, will show the number of pounds of that constituent in a ton; thus the Guanape guano, given farther on, is estimated as follows:

	Analysis.	Pounds.		
Ammonia	11.61 × 20 =	232 @ 22	$51	04
Soluble phosphoric acid	4.83 × 20 =	96 @ 11½	11	04
Reverted phosphoric acid	7.00 × 20 =	140 @ 10	14	00
Insoluble phosphoric acid	3.82 × 20 =	76 @ 5	3	80
Potash	.90 × 20 =	18 @ 5½		90
			$80	78

The price at which this guano sells is $70 a ton.

ANALYSES MADE DURING THE YEAR.

Super-phosphate of Lime, Crescent Bone Dust and Ammoniated Dissolved Bone. Ralston & Kirke, 170 Front street, New York.

	1	2	3
Phosphoric acid, soluble in water	5.73	.49	5.75
Phosphoric acid soluble in citrate of ammonia	1.43	.54	3.66
Phosphoric acid insoluble	4.10	8.53	2.51
Sulphuric acid	18.24	12.76	17.58
Lime	14.34	18.33	14.64
Ammonia	1.36	1.85	1.45
Potash	2.88	0.71	2.64
Soda	3 69	4.16	
Nitric acid	.13	.18	.14
Insoluble matter (sand, &c,)	3.12	3.46	2.29
Water	20.00	23 00	18.24

1. Super-phosphate of lime.
2. Crescent bone dust.
3. Ammoniated dissolved bone.

Super-phosphate of Lime. From Ralston & Kirke, 170 Front street, New York.

Phosphoric acid, soluble in water	8.80
Phosphoric acid, soluble in citrate of ammonia	.40
Phosphoric acid, insoluble	3 80
Sulphuric acid	13.79
Lime	16.56
Potash	2.80
Soda	4.75
Ammonia	2.10
Insoluble matter	3.00
Water	4.80

Crescent Bone. Ralston & Kirke, 170 Front street, New York.

Phosphoric acid, soluble in water	.57
Phosphoric acid, soluble in citrate of ammonia	3.72
Phosphoric acid, insoluble	9.53
Lime	21.05
Ammonia	2.60
Potash	1.30
Soda	7.53
Insoluble matter	3.40
Water	1.90

"*Defiance*" *Super-phosphate of Lime.* Geo. E. White, 160 Front St., New York.

Phosphoric Acid, soluble in water	6.65
" " in citrate of ammonia	1.75
" insoluble	9.20
Sulphuric Acid	17.46

Lime	24.51
Ammonia	.30
Potash and Soda	.60
Organic Matter	14.52
Insoluble Matter, (sand, &c)	7.50
Water	15.50

This fertilizer was bought early in the season, and used on the college farm. The large amount of insoluble phosphoric acid in it shows it to be imperfectly prepared.

Defiance Super-phosphate of Lime. George E. White, 160 Front St., New York.

Phosphoric acid, soluble in water	12.25
" " soluble in citrate of ammonia	.17
" " insoluble	2.94
Sulphuric Acid	29.02
Insoluble Matter, (sand, &c)	11.60

This sample came late in the season, and was also used on the college farm. The large per centage of soluble phosphoric acid indicates a fertilizer of much more value than that first received.

Super-phosphate of Lime. Gibbs & Deacon, Rancocas Phosphorus Works, Mount Holly.

Phosphoric acid, soluble in water	1.47
Phosphoric acid, soluble in citrate of ammonia	5.99
Phosphoric acid, iusolnble	4.22
Sulphuric acid	24.43
Lime	17.71
Ammonia	.28
Potash	4.46
Insoluble matter, (sand, &c.,)	4.22
Water	12.10

Super-phosphate of Lime. Gibbs & Deacon, Rancocas Phosphorus Works, Mount Holly.

Phosphoric acid, soluble in water	9.06 per cent.
Phosphoric acid, in citrate of ammonia, soluble	1.78 " "
Phosphoric acid, insoluble	1.04 " "
Water	18.57 " "

Super-phosphate of Lime. Lister Brothers, Newark, N. J.

Phosphoric acid, soluble in water	7.23
Phosphoric acid, soluble in citrate of ammonia	5.37
Phosphoric acid, insoluble	1.22
Ammonia	2.81
Potash	.36
Water	14.00

Super-phosphate of Lime. United States Fertilizing Company, Camden.

Phosphoric acid, soluble in water	11.01
Phosphoric acid, soluble in citrate of ammonia	4.09
Phosphoric acid, insoluble	2.94
Sulphuric acid	29.50
Lime	25.25
Insoluble matter, (sand, &c.,)	8.70
Water	15.85

Guanape Guano, sent by Francis Danzenbaker, Bridgeton, N. J.

Phosphoric acid, soluble in water	4.20
Phosphoric acid, soluble in citrate of ammonia	7.25
Phosphoric acid, insoluble	3.84
Ammonia	11.78
Potash	2.70
Lime	13.31
Sulphuric acid	4.36
Water	19.70

This sample represented a large cargo received by the ship Niagara, at Bridgeton, and distributed among the farmers in the surrounding country.

Guano from Curacoa. Yarnall & Trimble, Philadelphia.

Phosphoric acid, soluble in water	none.
Phosphoric acid, soluble in citrate of ammonia	4.80
Phosphoric acid, insoluble	21.50
Ammonia	.15
Potash	none.
Lime	41.18
Sulphuric acid	1.99

This quano would be valuable in the manufacture of super-phosphate of lime, as it contains a large per centage of insoluble phosphoric acid.

Guano. J. J. Allen's Sons, Philadelphia.

	1	2	3
Phosphoric acid, soluble in water	none.	none.	none.
Phosphoric acid, soluble in citrate of ammonia	4.65	4.61	4.09
Phosphoric acid, insoluble	14.38	15.10	15.36
Ammonia	.97	.77	.74
Potash	1.06	1.56	1.90
Lime	29.02	31.10	31.43
Sulphuric acid	3.68	3.26	3.53
Water	19.05	15.50	14.50

1, 2 and 3 represent three samples received lately from the above firm.

Pelican Guano. J. J. Allen's Sons, Philadelphia.

Phosphoric acid, soluble in water	none.
Phosphoric acid, soluble in citrate of ammonia	5.75
Phosphoric acid, insoluble	14.60
Ammonia	1.23
Potash	1.54
Lime	28.88
Sulphuric acid	2.98
Insoluble matter (sand, &c.)	.70
Water	16.30

Fish Guano. Cumberland Bone Company, Maine.

Phosphoric acid	4.42
Ammonia	7.61
Potash	.40
Lime	5.40
Water	29.82

This was sent to the college farm as a sample of fish waste, to be used for feeding sheep, but came in too warm weather, and had to be used as a fertilizer.

Blood Guano. Manhattan Fertilizing Company, 38 Platt street, New York.

Phosphoric acid, soluble in water	6.40
" " soluble in citrate of ammonia	.51
" " insoluble	4.61
Sulphuric acid	14.61
Ammonia	3.15
Potash	.76
Lime	13.72
Water	19.30

Nitrine. George E. White, 160 Front street, New York. Made from the blood and waste from slaughter houses.

Ammonia	9.14
Phosphoric acid, soluble in water	none.
" " insoluble	6.01
Lime	6.88
Potash	none.
Organic matter, (loss above 212°)	75.70
Water	7.60
Insoluble matter, (sand, &c.)	.80

Dried Blood. From the Jersey City Abattoir.

Ammonia	10.88
Insoluble matter, (sand, &c.,)	3.00

This material, the red portion of the blood, is sold to manufacturers of fertilizers.

Potato Fertilizer. H. J. Baker & Brother, 215 Pearl street, New York.

Phosphoric acid, soluble in water	3.07
" " soluble in citrate of ammonia	3.01
" " insoluble	.83
Ammonia	3.45
Potash	11.70
Soda	1.90
Lime	8.61
Sulphuric acid	15.85
Organic matter	33.30
Water	10.80
Insoluble matter	4.80

Muriate of Potash. Chloride of Potassium.

This commercial fertilizer gave, on examination, potassium equivalent to 56 per cent. of potash, or 88.6 per cent. of chloride of potassium, leaving 11.4 per cent. of water and foreign matter.

Lime from New Hope, Pa. Sent to the State Laboratory by John De Mott, of Middlebush.

Lime	53.82
Magnesia	13.86
Oxide of iron and alumina	2.40
Insoluble matter, (sand)	3.40

This lime is used in Central New Jersey, and is sold in some places at prices below that of other limes.

Ashes from Corn-cobs. Sent to the State Laboratory by George W. Thompson, New Brunswick.

Insoluble matter	27.80
Alumina and oxide of iron	7.50
Potash, (soluble in water)	23.16

TABLE OF ANALYSES.

	Super-phosphate of Lime.	Ralston & Kirk.	Super-phosphate of Lime.	Ammoniated Dissolved Bone.	Ralston & Kirk.	Super-phosphate of Lime.	U. S. Fertilizing Company.	Super-phosphate of Lime.	(Geo. E. White.	Super-phosphate of Lime.	Geo. E. White.	Super-phosphate of Lime.	Gibbs & Deacon.	Super-phosphate of Lime.	Gibbs & Deacon.	Super-phosphate of Lime.	Lister Bros.	Crescent Bone Dust.	Ralston & Kirke.	Crescent Bone Dust.	Ralston & Kirke.	(Ground Bone. (1)	Lister Bros.	Lister Bros. (2)	Potato Fertilizer.	H. J. Baker & Brother.	Guanape Guano.	From Francis Danzenbaker.	Guano from Curacoa.	Yarnall & Trimble.	Pelican Guano.	J. J. Allen's Sons.	Pelican Guano. (1)	J. J. Allen's Son's.	Pelican Guano. (2)	J. J. Allen's Sons.	Pelican Guano. (3)	J. J. Allen's Sons.	Fish Guano.	Cumberland Bone Co.	Blood Guano.	Manhattan Fertilizing Company.	Nitrin.	Geo. E. White.
Phosph'c acid, soluble in water	8.80	5.73	5.75	11.01	12.25	6.65	1.47	7.33	0.57	0.49	10.88	11.52	3.07	4.20	0.00	0.00	0.00	4.80	5.75	4.65	4.38	15.36	0.00	4.42	6.40	0.00
" " cit. of ammonia	0.40	1.43	3.66	2.51	2.94	1.75	5.99	5.57	3.72	0.54			3.01	7.35	4.80	5.75	4.09								0.51	
" " insoluble	3.80	4.10	2.51	2.94	0.17	9.20	4.22	1.23	9.53	8.53			0.83	3.84	21.50	14.60	14.38	15.36	15.10	4.61	4.09				4.61	6.01
Sulphuric acid	13.79	18.24	17.58	29.50	29.02	17.46	24.43			12.76			15.85	4.36	1.99	2.98	3.68	3.26	3.53						14.61	
Lime	16.56	14.34	14.64	25.25		24.51	17.71		21.05	18.33	16.50		8.61	13.31	41.18	28.88	29.02	31.10	31.43	5.40	7.61	3.15			13.72	6.88
Ammonia	2.10	1.36	1.45			0.30	0.28	2.81	2.60	1.85			3.45	11.78	0.15	1.23	0.97	0.77	0.74	0.40	0.76					
Potash	2.80	2.88	2.64			0.60	4.46	0.36	1.30	2.74			11.70	2.70		1.54	1.06	1.56	1.90							
Soda	4.75	3.69							7.53	4.16			1.90													
Oxide of iron and alumina													4.80			0.70										
Insoluble matter (in H.-Cl. acid)	3.00	3.12	2.29	8.70	11.60	7.50	4.22		3.40	3.46			33.30													0.80
Organic matter						14.52							10.80	19.70		16.30	19.05	15.50	14.50	29.82	19.30	7.60			75.70	7.60
Water	4.80	20.00	18.24	15.85		15.50	12.10	18.57	14.00	1.90	23.00															

FARM OF THE STATE AGRICULTURAL COLLEGE.

EXPERIMENTS ON THE GROWTH OF INDIAN CORN WITH DIFFERENT FERTILIZERS.

The experiments upon the growth of Indian corn, which have been in progress for three years past, have been continued this year. The ground on which the corn was grown is the lowest upon the farm, and was until within the last five years, a wet and poor swamp, but without any accumulation of peat or muck. The soil is clayey with considerable gravel in it. Five years ago it was thoroughly underdrained, and has since had in succession, crops of corn, oats, wheat and grass. It has been manured on the corn with barn-yard manure, and on the wheat with waste hair from the glue makers, but has not been well limed. This soil is not yet in as good condition as that of old well cultivated ground. It was chosen from our cornfield of fourteen acres, as the part most uniform in quality and previous culture.

The area of the plots experimented on, was one-tenth of an acre each. The ground was ploughed from four to five inches deep and the corn planted in hills three and one-half feet apart, and with three or four stalks in each hill. The corn has a yellow dent kernel, rather small sized ear of twelve to sixteen rows, and has been cultivated on the College Farm, and by the late Dr. F. R. Smith, of this place, from whom it was obtained, for many years past. It was planted about the 20th of May, and was cut in the latter part of September.

Table showing experiment plots, with the number of pounds of manure per acre applied to them, with the value per acre of each manure.

FERTILIZERS.	NUMBERS OF THE PLOTS.									
	1	2	3	4	5	6	7	8	9	10
Muriate of potash	100	100	100	100	.....	.....	100	100	...	.....
Sulphate of ammonia	200	400	200	.....	.....	400	.....	.....	...	.....
Super-phosphate of lime.	300	300	500	.....	.....	.....	300	500	...	.....
Blood fertilizer	.....	.....	.....	.....	.....	.....	500	200	...	.....
Barn-yard manure	.....	.....	.....	.....	.....	.....	.....	.....	...	16t'ns
Value	$16 65	26 65	19 25	2 75	.....	20 00	13 45	13 45	...	40 00

Table showing the weight of corn and of stalks in pounds, per acre, with the values of the corn and stalks, and the gain in value of products per acre on each lot.

	1	2	3	4	5	6	7	8	9	10
Corn in pounds.....	8100	8200	8550	8150	7000	7100	7700	8000	6950	7650
Corn in bushels.....	99	100	104	100	85	86	94	98	85	93
Stalks in pounds.....	6500	6700	7200	6150	5500	5500	5900	6380	5100	6400
Stalks in tons.....	3.25	3.35	3.60	3.07	2.75	2.75	2.95	3.19	2.55	3.20
Value of corn.....	$74 25	75 00	78 00	75 00	63 75	64 50	70 50	73 50	63 75	69 75
Value of stalks.....	$14 68	14 92	15 56	14 80	12 72	12 88	14 00	14 56	12 28	13 88
Whole value.....	$88 93	89 92	93 56	89 80	76 47	77 38	84 50	88 06	76 03	83 63
Gain in value.....	$12 68	13 67	17 31	13 55	.....	1 13	8 25	11 81	.....	7 38

In making the computations on the amount of corn, eighty-two pounds of ears have been allowed for each bushel of shelled corn, as we found on drying some that eighty-two pounds after drying, only weighed seventy pounds, which is the weight allowed for a bushel, when the corn is dry and unshelled. The prices of the commercial fertilizers are those paid in New York. The price of the corn, seventy-five cents per bushel, is its market value, at the date of this report. The stalks are sold by the bundle at four cents each, and their average weight was twenty-two pounds.

FERTILIZERS.

The muriate of potash, potassium chloride, was a good commercial article, containing fifty per cent. of potash. Its price was two and three-fourth cents per pound; it was sprinkled on the hills after planting, and no burning or other ill effect was observed from its use.

The sulphate of ammonia contained twenty-five per cent. of ammonia, and was a good commercial sample of that chemical substance. It was in hard lumps, inconvenient and troublesome to crush fine. The price was five cents per pound.

The super-phosphate of lime was made from three-fourths Carolina phosphate, and one-fourth burnt bones. It was bought to contain ten per cent. of soluble phosphoric acid, but, on analysis, was found to contain only 8.3 per cent. soluble and reverted phosphoric acid. It contained 9.02 per cent. of *insoluble* phosphoric acid, from which I infer that it was not properly manufactured. It contained no ammonia, and was bought solely on account of its soluble and reverted phosphoric acid. The price was $1.30 per hundred pounds.

The blood fertilizer, made from slaughter-house refuse, contained $9\frac{13}{100}$ per cent. of ammonia and 6.1 per cent. phosphoric acid, in

ground bone. Its price was $2.12 per hundred pounds. The trial was made to compare it with sulphate of ammonia, as a source of ammonia.

The barn-yard manure was from the pile of barn-yard and stable manure; was made by well-fed animals, and was well rotted and fine. It was applied broadcast. Such manure costs us from $1.50 to $2.00 a load in town, besides the hauling; and four loads are all that one team can bring to the farm in a day. The cost is not over stated at $2.50 per ton.

CONCLUSIONS.

A comparison of these results indicates that the muriate of potash has increased the weight of stalks decidedly—plots 5, 6, and 9, upon which none was used, having the smallest weight of stalks. This agrees with the results of the experiments with this substance on the growth of corn in 1872, 1873, and 1874. Those of 1872 and 1873, which were upon the lighter and naturally drained land of the farm, showed no marked increase of the grain. That of 1874, and this of the present year, show a decided increase in the weight of the corn as well as of the stalks. Both these latter were upon heavy soil, which has always been too wet to be cultivated till within the last five years. This continuous soaking may have had something to do with creating a need for potash in the soil.

No benefit appears from the use of sulphate of ammonia, when applied in increased quantity, as in plot 2, compared with plot 1; or when applied as in plot 6, compared with plots 5 and 9. The stalks appeared much larger, and the leaves broader and greener, in plot 6 than on plots 5 and 9, but they were not heavier, and they did not stand up as well. In the experiment of 1872 the stalks had the same promising appearance, but were really *lighter* than those on which no fertilizer was used.

The super-phosphate of lime has produced some effect in increasing the crops, and where the largest quantity was used, as in plots 3 and 8, there the crop was largest.

The barn-yard manure has produced less increase of the crop than any of the commercial fertilizers, except the sulphate of ammonia. Of the fertilizers used, it will be seen that none, except that on plot 4, have paid their cost in the increased value of the crop. The sulphate of ammonia is probably mostly exhausted, and much of the potash. A large part of the super-phosphate and of the barn-yard manure are still in the ground, and ready to benefit succeeding crops. And it must not be forgotten that it is the manure left over from former crops, which has put the soil in condition to raise eighty-five bushels of shelled corn to the acre, without any addition of manure to it this year. If the sulphate of ammonia had not been used at all, the crop would have been just as large as it is now, and

the increased crops would have paid the cost of all the other substances used.

Experiment *on the growth of sweet or sugar corn.* This experiment was made to try the productiveness and value of the above mentioned variety of corn. It was made in consequence of the large crop raised in Salem in the summer of 1873, by David Pettit. Our seed was obtained from him in the spring of 1874, and a small patch of ground was planted with it, but the crop was not measured. This year a tenth of an acre of ground, well dressed with barn-yard manure, was planted with it, and the crop measured twenty bushels of ears. It was planted early in June, and was cut about the middle of September. The hills were three feet apart and had four or five stalks in each hill. They might have been closer, probably three by two feet, as planted by Mr. Pettit. The crop is a remarkably good one, and we propose to make further experiments upon this variety of corn.

Experiment *on the growth of potatoes with different fertilizers.* Our soil is not well adapted to potato growing. The subsoil is so close that water, after rains, does not sink away from the surface quick enough, and the beating of the rain upon the soil leaves it in such condition that a hard and close crust is formed upon it as it dries. The experiment was made upon a plot that has not been cultivated or manured much for many years. The soil is a gravelly loam. It was ploughed about five inches deep, marked out in rows two and a-half feet apart, each way, and a subsoil plough was run in each mark to the depth of ten or twelve inches. The fertilizers were then scattered along in the rows, and the potatoes planted in hills. The seed was of large potatoes, cut to have two eyes on each piece, and two pieces in a hill. The cultivation was mainly with the plow. The variety was the Peerless. The vines were thickly covered with the Colorado potato bug, but by the frequent use of Paris Green, were saved from any great damage.

The fertilizers used were—

Forester's Potato fertilizer, from H. J. Baker & Brother, 215 Pearl street, New York.

Blood Guano, from the Manhattan Fertilizing Company, Platt street, New York.

A mixture, prepared on the College Farm from chemical fertilizers.

The crop per acre was computed from the product of one hundred hills of each, which was weighed, and sixty pounds allowed for each bushel, and was as follows:

Potato fertilizer	221	bushels
Blood guano	227	"
Farm mixture	242	"

The potato fertilizer, on analysis, shows the following composition:

Phosphoric acid, soluble in water	3.07	per cent.
" " " in citrate of ammonia	3.83	" "
" " insoluble	.83	" "
Potash	11.70	" "
Ammonia	1.00	" "
Lime	8.61	" "
Sulphuric acid	15.85	" "

It was sent by Messrs. Baker for trial; was used at the rate of 1300 pounds per acre; and its cost, I presume, was $26 per acre.

The blood guano is not prepared specially for potato growing, though an excellent manure. Its composition is as follows:

Phosphoric acid, soluble in water	6.40	per cent.
" " " in citrate of ammonia	.51	" "
" " insoluble	4.61	" "
Potash, soluble in water	.72	" "
Ammonia	3.10	" "

This fertilizer was sent by the Manhattan Fertilizing Company, for trial on the farm, and was used at the rate of eleven hundred pounds per acre. Its cost per acre was about $25.

The farm mixture was made of four hundred pounds of superphosphate of lime, two hundred sulphate of ammonia, one hundred pounds of muriate of potash, three hundred pounds of plaster, or one thousand pounds per acre. Its cost was $20. Its analysis would show:

Phosphoric acid, soluble and reverted	3.3	per cent.
Potash, soluble in water	5.0	"
Ammonia	5.0	"

The vines were much the most luxuriant where the blood-guano was used, and next to these in appearance were those grown with the farm mixture.

In quality, however, the potatoes were in the reverse order, those grown with the potato fertilizer are still nearly free from rot; those grown with the farm-mixture have shown some signs of rot, and those grown with the blood-guano were rotting so fast that we were glad to sell them at a price much below that of sound potatoes.

The experiments are satisfactory in regard to the amount of the crop and the mode of cultivation. They show, too, that potash is necessary for the growth of sound potatoes. Ammonia does not appear to have been of much benefit. In another trial I should double the amount of potash and phosphoric acid, diminish the sulphate of ammonia one-half, and keep the sulphate of lime as now.

This would only increase the cost to $23 an acre, and I think would suit the crop much better.

Experiments upon wheat were begun with Lister's bone-meal, blood-guano, muriate of potash, and other fertilizers, but the crop was so badly damaged with the ice last winter, that no conclusions can be drawn from them. Others of the same kind have been begun on the wheat now growing.

Experiments with muriate of potash upon grass have not yet shown any very marked results, but are in progress, and will be continued.

Experiments upon composts of muck with lime, and muck with lime slaked with brine are in progress, but the chemical examination of them is not yet completed.

The farm of the Agricultural College has now been brought to such a state of tillage and fertility that it can be used for making experiments in a satisfactory way. If means can be provided, an extended course of experiments on fertilizers, tillage, crops, stock-feeding and stock-raising can be carried on. Such experiments however, are expensive, and at present, the means available for conducting them are too limited to fairly meet the demands or the interests of agriculture. To show the uses of such experiment stations, the following article is re-printed from the annual report of the Connecticut Board of Agriculture, for 1873, pp. 92–99.

AGRICULTURAL EXPERIMENT STATIONS IN EUROPE.

BY PROF. S. W. JOHNSON, OF THE SHEFFIELD SCIENTIFIC SCHOOL, NEW HAVEN, CONNECTICUT.

When the first German experiment station was put in operation, in 1851, by fitting up some rooms in the farm house, at Moeckern, for chemical and physiological investigations with direct reference to the work of the farm, it was no new idea that scientific research might be, or must be, of immense advantage, if put to the study of agricultural questions, for the beginnings made by Chaptal, Davy, Saussure and Sprengel, in the early part of this century, had been most ably followed up by Liebig, at the University of Giessen, and by the ardent young men whom he had vitalized by his example and instruction, and the educated landlords of Europe were already pocketing the proceeds of chemistry applied to agriculture.

In 1843 the Agricultural Chemistry Association, of Scotland, began its five years of chemical work. Boussingault, in France, and Lawes, in England, had already been prosecuting their laborious investigations for years, and in many schools and Universities were to be found zealous workers in this field, while a number of influential agricultural societies had their more or less active chemists.

But the enterprise begun at Moeckern, in 1851, marked a new epoch in the history of agriculture. That experiment station was the first in which a society of farmers undertook to establish scientific investigations, as a necessarry and permanent branch of agricultural business, and secured for its support the aid of their government by manifesting their own readiness to contribute to its endowment.

The example thus given was so brilliant, so solid and so infectious, that within two years another Saxon constituency, in the town of Chemnitz, set up a second station, and the years 1864 and 1867 are the only ones, since that time, which have failed to witness the founding of one or more similar institutions.

The experiment station shortly came to be regarded, not as a costly embellishment, or an agricultural luxury, in which universities or wealthy gentlemen might harmlessly indulge, but as a remunerative and most necessary agency in the education of farmers. It was seen to be highly serviceable in teaching much that was already known and practiced by a few, but that remained unappreciated by the many, as well as the only means of pushing inquiry in a variety of directions, where urgent need of newer and completer knowledge was felt.

The rate at which the idea of an agricultural experiment station fructified in Continental Europe may be gathered from the following statement of the number of stations in existence there at the expiration of each period of five years that has passed since the establishment of the station at Moeckern; in 1851, one; in 1856, five; in 1861, fifteen; in 1866, thirty; in 1871, fifty-six; in 1873, sixty-three. There are thus sixty-three of these experiment stations in Europe, each employing from one to five investigators, trained in the great modern schools of chemistry and physiology.

Some of these stations are chiefly devoted to the study of cattle-feeding, as at Weende, Proskau and Milan; some to experiments on the conditions of vegetable growth, and the action of manures, as at Dahme, Ida-Marienhuette; some to tobacco and grape culture, as at Carlsruhe; some to grape culture and wine making, as at Wiesbaden and Padua. The station at Udine is devoted to studies in silk production; those at Stockholm and Lodi to milk industry. The Bonn and Rostock stations are occupied with the analysis of commercial manures. That at Tharandt has a department for testing the purity and vitality of seeds. Most of the stations, however, combine several of these objects in their operations.

During the years 1851 to 1857, the Moeckern station published five reports of the experiments and researches there conducted, making together a most valuable volume of 574 octavo pages. The subjects of the investigations reported on are given on page 96. (pages 24 and 25 of this report). Many others of the German stations have issued similar reports in pamphlet or book form.

In 1859 began the publication of a special organ of the workers in what had thus grown to be a national enterprise. This journal, entitled Versuch Stationen, issued in monthly parts, continues to this day. For the first years of its existence it formed a closely printed annual volume of two hundred and forty to three hundred and sixty pages. In 1864 it thickened to nearly five hundred pages, and still maintains that dimensions.

In 1863 the number of chemists and investigators connected with the experiment stations and agricultural schools had become sufficient to warrant an annual convention for discussions and exchange of views, and for ten years this general conference of the agricultural explorers of Germany has been only once interrupted, and that by nothing less than the great war of 1866.

LIST OF AGRICULTURAL EXPERIMENT STATIONS OF GERMANY AND CONTINENTAL EUROPE.

		Founded in
Mœckern	Saxony	1851
Chemnitz	"	1853
Weidlitz (now Pommritz)	"	1857
Dresden	"	1862
[Halle	"	removed from Salzmunde in 1865]
Tharandt	"	1869
[Dobeln	"	1872]
Leipsic	"	1872
St. Nicholas (now Bonn)	Prussia	1856
Dahme	"	1857
Ida Marienhutte	"	1857
Insterburg	"	1858
Kuschen	"	1862
Regenwalde	"	1863
Eldena	"	1865
Proskau	"	1865
Poppelsdorf	"	1865
Waldau	"	1865
Rostock	"	1870
Kiel	"	1870
Hildesheim	"	1870
Darmstadt	"	1870
Breslau	"	1870
Munster	"	1871
Bromberg	"	1873
Weende	Hanover	1857
Brunswick	"	1862
Haidau	"	1857
Jena	Thuringia	1862
Zwœtzen	"	1872
Cœthen	Anhalt	1865
Metz	Alsace Lothringia	1869
Rufach	"	1874
Wiesbaden	Nassau	1868
[Altmorshen	"	——]
Hohenheim	Wirtemberg	1865
Neustadt	Rhenish Bavaria	1872

Munich	Bavaria	1860
Memmingen (now Augsburg)	"	1865
Bayreuth	"	1866
[Lienfenmoss and Rothenfes	"	]
[Landshut	"	]
Carlsruhe	Baden	1859
Cappel	Schleswig Holstein	1869
[Kiel	"	1874]
Prague	Austria	1855
Blansko	"	1857
Liebwerd	"	1865
Lobositz	"	1865
Prilep	"	1868
Kloster—Neuberg	"	1868
Gorz	"	1869
Vienna	"	1869
Mariabrunn	"	1871
Ungarisch—Altenburg	"	1873
Ultuna	Sweden	1861
Stockholm	"	1863
Rutu	Switzerland	1869
Stanz	"	1871
Modena	Italy	1870
Florence	"	1870
Udine	"	1870
Turin	"	1870
Milan	"	1871
Lodi	"	1871
Padua	"	1871
Furli	"	1872
Rome	"	1872
Nancy	France	1869
Gembloux	Belgium	1871

PRIVATE, SOCIETY, AND ACADEMIC AGRICULTURAL LABORATORIES IN EUROPE.

Other institutions, differently organized, for the most part, but working efficiently, for the advance of agricultural science, are:

1. The private laboratory and farm of Boussingault, at Bechelbronn, near Strasburg, in Alsatia, dating back, as a source of most valuable agricultural investigations, to the year 1835.

2. The private laboratory and experimental grounds of John Bennet Lawes, at Rothamsted, England, where, with the co-operation of Dr. J. H. Gilbert, a vast number of admirable field and stall experiments have been carried on since 1845, at an annual cost of some $15,000. The laboratory and experimental grounds, with an endowment fund of £100,000 sterling, have been placed in trust by Mr. Lawes, to remain forever devoted to the investigation of agricultural science.

3. The Highland and Agricultural Society of Scotland have employed, since 1849, Dr. Anderson as chemist, and assistants at Glasgow.

4. The Royal Agricultural Society of England, has employed Prof. Way and Dr. Voelcker, and assistants at London. Dr. Voelcker receives £300 sterling as salary, and £200 sterling for investigations, and fees for analyses, which number some seven hundred annually. This work has been going on for over twenty years.

5. The Royal College at Cirencester, England, has had much valuable work done in its laboratory by Dr. Voelcker and Prof. Church, and their assistants. Agricultural chemistry laboratories, in various German universities, have actively contributed to the study of practical questions, viz.:

6. University of Berlin, Dr. Eichhorn.
7. University of Leipsic, Dr. Knop.
8. University of Heidelberg, Dr. Mayer.
9. University of Würzburg, Dr. Hilger.
10. University of Breslau, Dr. Cohn.
11. University of Göttingen, Dr. Wicke and Dr. Tollens.

Last of all, I mention the laboratories of the Universities of Giessen and Munich, where the great master, Justus Liebig, pursued his labors for more than forty years, and the laboratory of the Royal School of Agriculture and Forestry, at Tharandt, whence Adolph Stoeckhardt went to preach his chemical field sermons through all the villages of Saxony.

BUILDINGS AND WORK OF THE STATION PROSKAU, 1869–1871.

The Prussian station Proskau, was founded in 1869, under the direction of Dr. Weiske, with the more especial object of studying animal physiology, with reference to cattle feeding. The apartments of the station are accordingly arranged for feeding experiments and for chemical analyses of cattle food and excrements. They consist, 1st, of a main chemical laboratory; 2d, an adjoining room for the chemical balances and the library; 3d, a furnace laboratory for operations requiring fire; 4th, experimental stable, with water-tight floor and stalls; arrangements for collecting dung and urine without loss, and for maintaining a comfortable and uniform temperature in winter; 5th, scale-shed, for weighing the cattle rations; 6th, store-room, for supplies of hay and other feed; 7th, lodgings for the assistants and servants; and 8th, residence of the director.

The investigations carried on up to April, 1872 were—

1. On the digestibility, in man, of cellulose (woody fibre.)
2. Digestibility of woody fibre by swine.
3. Composition and quantity of the roots and stubble left in the field by various crops after harvest.
4. Comparative advantages of pasturing and soiling of a given surface.

5. Composition of urinary calculi from sheep.
6. Composition of various kinds of fodder grown under particular circumstances.
7. Effect of shade of trees on adjoining vegetation.
8. Effect of adding phosphate of lime to fodder on the composition of milk.
9. Effects on the bones of animals of depriving food, of lime and phosphates.
10. Effects on the bones, of adding phosphates to food.
11. Composition of the urine of goats when fed on purely vegetable and on purely animal food.

WORK OF THE HALLE STATION IN 1867.

1. Investigations on the feeding and nutrition of milk-producing animals.
2. Investigations on the means of preventing potato disease.
3. Experiments on the influence of potash fertilizers upon the quality of sugar beets and the yield of barley.
4. Experiments on the disinfection of the water of factories.
5. Observation on the temperature of soil at different depths.
6. Influence of the fodder on the weakness of bones of cattle.

WORK OF THE HALLE STATION IN 1870.

1. Fatting experiments with twelve sheep as to the comparative feeding value of lupines and cole seed cake.
2. Study of the changes which beets and beet leaves undergo in souring.
3. Continuous culture of sugar-beets on the same field.
4. Testing the quality of the so-called Bestchorn sugar—richest beet.
5. Influence of annually renewed use of saline manures on the quantity of saline matter taken up by beets.
6. Continuation of experiments on the nutritive processes in the milk-giving animal. Fourth series—effect of feed on the quantity of milk and its ingredients.
7. Observations on the temperature of the soil at different depths.
8. Construction of respiration apparatus and preliminary trials therewith.
9. Execution of 776 analyses of fertilizers.

REVENUES AND WORKING FORCE OF TEN PRUSSIAN AGRICULTURAL EXPERIMENT STATIONS, FOR THE YEAR 1870.

Name of Station.	REVENUE, IN DOLLARS--GOLD. Gov't.	Ag'l Socit's.	Analy's of Fert.	Total.	Working Force.
Halle	864	.....	3.254	4.118	Director and 3 Ass't Chemists.
Regenwalde	1.152	417	108	1.677	" " 2 " "
Bown	576	606	288	1.470	" " 0 " "
Kusepen	757	236	101	1.094	" " 1 " "
Insterburg	648	252	44	944	" " 1 " "
Ida-Marienhutte	792	216	1.301	2.309	" " 2 " "
Dahure	2.178	324	216	2.826[1]	" " 2 " "*
Weende	1.008	1.349	427	2.399	" " 2 " "†
Alt Morschen	936	888	108	1.318[2]	" " 1 " "
Wiesbaden	1.296	.....	179	1.475	" " 2 " "

*Also assistant in vegetable physiology.
†An assistant in agriculture.
1 includes $108 received, private contribution.
2 includes $186 received, private contribution.

In Austria, according to the budget of the Royal Ministry of Agriculture and Forestry for the year 1875, the following sums were put in the estimates of that year for the support of experiments in that department:

	Ordinary.	Extraordinary.
Expenditures	122,800 marks.	18,600 marks.
Receipts	12,200 "	

Making a total of expenditures of 141,400 marks, equivalent to $33,885 gold.

EXPERIMENTS WITH COMMERCIAL FERTILIZERS.

The following reply of Francis Danzenbaker, of the Cumberland County Agricultural and Horticultural Society, to the secretary's circular letter of last year, came too late for insertion in the report of 1874.

Of commercial fertilizers, he says: "Nearly all the prominent brands are used in the county; Peruvian guano is most popular for wheat; ground bone is fast growing in favor with all classes of farmers, for corn, as it is a more permanent improver of the soil, showing its effects in the wheat and other crops following, especially in grass. Large crops of grass and hay go hand in hand with thrift in farming. Beckhardt and Smalley's ground bone, manufactured here in Bridgeton, sells at $48 per ton. Walton and Wham's ground bone and phosphate, of Wilmington, Delaware; Baugh & Son's ground bone, Allentown bone, Lister Bro.'s bone, of Newark, and bone sawings from button factories in Philadelphia, are the

principal kinds of bone used here. Of phosphate, Whann's, E. F. Coe's, Baugh & Sons, and Moro Phillips' are in general use. Coes & Richmond's XXX guano is also used very generally.

Our farmers derive most benefit from guano by applying from one hundred to two hundred pounds upon an acre, sowed on a light dressing of manure. In this way, one hundred pounds, with fifteen loads of yard manure, will give better results than twenty-five loads of cow-yard manure alone per acre. The best results on a given outlay for manure, will be obtained by using two or more kinds together, as guano and phosphate, or guano and bone, or guano and manure, marl and manure, &c. By mixing E. F. Coe's phosphate, two parts, to one part of guano, thirty-seven bushels of red wheat have been grown on an acre, and the average yield of wheat on ground manured with four hundred and fifty pounds of this mixture per acre, was thirty-two bushels, in 1869; thirty-one bushels in 1871; thirty and one-half bushels in 1872, and thirty-seven bushels in 1873. This mixture applied at the same rate, (four hundred and fifty pounds per acre) on potatoes, and sowed in the drills, with manure applied broadcast, has produced excellent crops. We have proved by careful experiment that it is highly advantageous to use guano and bone together. A lot of clover sod, exactly alike in condition, was marked off in three plots. The first plot was dressed with bone, the second with guano, and the third with guano and bone mixed, (one part of guano and two parts of bone) and the same value of dressing, $9.00 per acre was given to each plot. The plot dressed with bone started more slowly, and did not make as much stalk as that which received the guano, but there was only a half bushel difference in the yield—shelled corn—the guano being best. There must have been considerable bone left in the soil for future crops. This will make it the cheapest fertilizer of the two. The plot dressed with guano and bone mixed, produced thirteen bushels of shelled corn more than the second plot, upon which the guano alone was applied. These results showed that the greatest advantage was in using these fertilizers together.

SOILS AND THEIR COMPOSITION.

The chemical constitution of the soil is the starting point, and the most important element in any systematic and thorough treatise on agriculture. And it should always be considered as the basis in all agricultural experiments, however manifold or varied in character these may be, upon which to found substantial and correct conclusions. In view of the importance of keeping this constantly in mind, the composition of the typical classes of soils found in New Jersey is given in the following table. The several columns are averages of analyses which appeared in the First Annual Report

of the Board of Agriculture on pp. 11–30. The subsoils and worn out soils have been left out in this preparation of averages, so as to make them more properly representative of the several classes. It is evident at once, the greater the number of analyses, and the more widely distributed the localities which are brought into this comparison, the more accurately these figures represent their classes of soils, and the conclusions drawn from any comparative study of such, possess so much more value. The localities are given at the end of the table. It will also be observed that the localities are far too few, and that the number of analyses is also too small, but it is the best in hand, and is presented as a provisional arrangement, until, as is hoped for, this department of soil analysis shall become one of the most important sections in the general scheme, embracing all the varied branches of our agricultural industry, and one which shall appear regularly each year, with its new facts and figures in this Report of the New Jersey Board of Agriculture.

TABLE OF SOIL ANALYSES.

	Gneiss soils.	Magnesian Limestone soils.	Slate soils.	Red Shale soils.	Marl soils.	Miocene soils.	Soils of drift of South Jersey.	Soils of the alluvium of the sea border.	Soils of tide marshes.
Silica	68.89	65.06	65.75	65.80	79.30	84.80	94.62	85.41	59.81
Alumina	11.55	14.75	14.37	13.29	1.81	6.53	2.21	5.29	12.42
Oxide of iron	4.95	4.51	6.10	5.05	1.71	1.92	0.60	1.36	4.93
Lime	1.11	0.67	0.56	0.84	0.82	0.48	0.08	0.55	1.12
Magnesia	1.37	1.55	1.66	1.21	0.23	0.40	0.12	0.37	1.49
Potash	1.95	4.57	3.86	1.74	0.77	0.81	0.13	0.80	1.81
Soda	0.41	0.53	0.10	1.12	0.03	0.44	0.14	0.26	0.98
Sulphuric acid	0.04	0.02	0.04	0.09	0.12	0.08	0.04	0.03	1.15
Chlorine	trace.	trace.	trace.	trace.	0.14	0.01	trace.	trace.	0.72
Phosphoric acid	0.18	0.16	0.17	0.15	0.11	0.05	0.01	0.06	0.44
Organic matter	6.86	5.52	5.12	7.45	12.56	1.90	1.61	4.14	7.45
Water	1.64	1.45	1.68	2.70	2.24	1.60	0.56	1.37	6.68
Total	98.95	98.79	99.41	99.44	99.84	99.02	100.12	99.64	99.00
Carbonic acid									0.70

The *gneiss soils* column in this table is an average made up from the analyses of seven different soils from Warren and Passaic counties.

The *magnesian limestone* column is an average of six soils, four of them found in Warren county, and two from the same formation, near Lebanon, Pennsylvania.

The third column, *slate soils*, represents two localities near Asbury, Warren county.

The *red shale* is an average of two analyses of soils near New Brunswick.

From the *marl* there is only one analysis—of a soil from Woodbury, Gloucester county.

The *miocene* also is represented by a single analysis, that of a soil near Greenwich, Cumberland county.

From the *drift* of the southern part of the State, six localities are represented by soils, the average composition of which appears in this column. They are from Ocean, Burlington, Camden, and Atlantic counties.

The average of the *alluvial* soils is made from four analyses. These are from Burlington, Salem and Cape May counties. The composition of the soil of the *tide-marshes* is an average of three analyses, made of soils from Salem and Cape May counties.

These analyses are by *fusion*, and they give, therefore, the ultimate constitution of the soils and not the elements soluble in water or weak acids, or the amount of plant food immediately available. The *soluble* portion is included with that, which is locked up in insoluble forms or combination, in the total amount of the several constituents. Thus, in the soils of the *gneiss* or *magnesian limestone* formations there is a comparatively large amount of potash, but nearly all of it is not soluble, even in strong acids. So that these figures must be understood as expressing the *total* amounts of the several constituents.

THE HUMUS BODIES IN THEIR RELATION TO THE NUTRITION OF PLANTS.

*B. E. Simon, director of the experiment station at Ghent.**

The products resulting from the decomposition of the organic matters of the soil (the so-called humus bodies) have always been highly esteemed and regarded as the carriers of fertility of our soils.

Our views upon the agency of the humus in the soil are limited to its utility alone, whether of a physical or of an indirectly chemical nature. Although much effort has been directed towards the separation and definition of these bodies there is still a lack of clearness in regard to their action in the soil, and there is no explanation of their share in the nutrition of plants. The following statements may provisionally call attention to a general investigation of the important question does humus take part or not in the nutrition of plants?

§1. *Is the nitrogen which the humic acid contains an integral constituent of the same?*

*This article is printed in full in Experiment Stations, for 1875. The paper here printed is only an abstract of the original, translated by Prof. J. C. Smock.

The quantity of nitrogen in this acid varies considerably and ranges according to analyses of Mulder and Soubeiran, between 2.5 and 3.8 per cent, and is even more according to other authorities.

A series of careful experiments with humic acid was made to ascertain the source of this nitrogen, and to settle this question. These lead to the following conclusions, viz.:

1. Humic acid possesses the property of absorbing nitrogen from the air and forming ammonia.

2. The formation of the carbonic acid follows, as a result of this absorption of nitrogen. This may occur in the decomposition of water, the hydrogen combining with the nitrogen and thus forming ammonia, and the oxygen combining with the carbon of the humic acid to form carbonic acid.

3. Humic acid is insoluble in water free from air, and particularly when the water contains no nitrogen. It keeps therein all the properties which it, according to its proportion, possessed.

§ 2. *Examination of the double compounds*, which the organic matter of the soil *forms with mineral substances.* My investigations have been directed to the synthesis of these organic—mineral compounds—to eliminate and study them individually. My first experiments related to the action of phosphoric acid upon humic acid. The fact that a reaction between the phosphoric acid and the organic elements of the soil is possible first directed my attention to this acid. When, for example, humus is treated with phosphate of soda or ammonia, a considerable portion of the organic matter is dissolved. Schumacker found, in his absorption experiment, that humus took up a much greater per centage of phosphate of soda than of any other salt. My own experiments, made with peat, also show this absorptive property of humus for this salt. The greater quantity of soluble phosphoric acid in soils than in subsoils is probably due to the fact that the soils are richer than the subsoils in soluble organic matter. My experiments with these two acids settles the fact that double compounds of the organic matter of the soil (apocrenic acid) with phosphoric acid exist,* and the existence of three such combinations agrees with the statement that humic acid decomposes the phosphate of lime, making the phosphoric acid of the phosphate soluble in water, ammonia and acetic acid.

§ 3. *Dialysis of the humus bodies.* The penetrating properties of humic acid, humate of ammonia and two of these double compounds, were tested with the following results:

Humic acid is not able to pass through parchment paper, even

* Partial analysis of two of these compounds showed the following composition:

	A	B
Carbon	39.00	39.79
Hydrogen	6.94	5.27
Phosphoric acid	5.16	2.49

B contained 5.59 per cent of nitrogen.

when ammoniacal water is used as the liquid of dialysis. Humate of ammonia (in solution) does not go through vegetable membrane. The double compounds pass quickly and unaltered through parchment paper. But a mixture of one of these compounds (A) and humate of ammonia was separated, in the course of three days, through parchment paper.

These facts are of immense importance in plant nutrition, and explain the diversity of opinion which prevails, concerning the penetrating power of humus bodies.

LIME.

The need for stricter economy in the management of fertilizers has drawn attention to lime. It is one of our cheapest fertilizers; is used in enormous quantities, and, as is said in one of the papers in this report, has doubled our average crops of wheat and corn. The following statements in regard to our supplies of limestone and lime, and its manufacture and uses are presented.

LIME—ITS SOURCES AND USES IN AGRICULTURE.

New Jersey is well supplied with limestones and calcareous materials which *can be used raw as fertilizers or be burned into lime.* The limestone areas in Sussex, Warren, Passaic, Morris, Somerset and Hunterdon counties are large and well-known, in the aggregate amounting to about 400 square miles of the surface, or one-fifth of the combined area of these counties. In the central and southern portions of the State no limestone rock, like that of the northern counties is found, but there is a long and narrow belt of calcareous marl and yellow limestone and lime-sand, which furnishes calcareous matter for the soil and some of which can be burned into lime. All along the Atlantic coast and Delaware Bay the immense quantity of oyster shells obtained from their waters, affords a very good lime for agricultural uses. So that it is safe to say there is not a point in the State more than twenty miles from limestone outcrops calcareous marls, or other natural products which can be used to make lime for use in agriculture. In this no account is taken of our railroad facilities. When we examine the map and see how this net-work of railroads has its lines crossing every county we find that there is *no* point *fifteen miles* away from a *railway station*, and that nearly all of these lines in some part of their course cross over or run to some one of these natural sources of lime. Our farmers have a supply of this fertilizer near their homes, and hence the comparatively low price that prevails throughout the State.

For the exact boundaries of the several limestone and marl out-

crops, the reader may consult the maps of the Geological Survey of the State or the Agricultural map of the State in the First Annual Report of the Board of Agriculture.

The most extensive limestone formation of the State is the magnesian limestone, so named from the magnesia, which is one of its essential constituents, and which is associated with the lime in a fixed proportion. Such limestone is sometimes termed *dolomitic*, because of its similarity in composition to *dolomite*, a mineral containing 54.35 per cent. of carbonate of lime and 45.65 per cent. of carbonate of magnesia. The analyses given below will be seen to correspond closely to these proportions.

This limestone furnishes most of the lime made in the State. There are large kilns at Peapack, Clinton, Little York, Greenville, Bloomsbury, Springtown, Harmony, Belvidere, Columbia, New Hampton, Hackettstown, Beattystown, Carpentersville, Riegelsville, Newton and other places. A great deal of lime is shipped over the Belvidere Delaware railroad and the Central railroad, from points on these lines. There is not so much lime burned at Peapack as there was ten or twenty years ago. This decrease is owing to the great amount of lime carried into Somerset county by the Central railroad. The business of burning lime along the Delaware river is large. At Riegelsville, Alexander Smith has six kilns; near Carpentersville, Charles Farney has four kilns, John Fine two kilns, and Charles W. Cope has four kilns. These are all kept running a good part of the year. They are all at the side of the Belvidere Delaware railroad, and most of their lime is sent southward. Near Bloomsbury, John Hart and John Smith burn a great deal of lime. The former has nine kilns. He sells at 10½ cents delivered on the line of the Central railroad. At William D. Vleit's quarry, one and a half miles south of Hackettstown, three kiln's produced last year (1874) 55,550 bushels, price 10 and 12 cents per bushel. Complete data concerning the product at the different localities, prices, &c., are wanting, and only these few facts, which were indirectly collected during the past season, are here presented.

Bordering this magnesian limestone, and adjoining the slate, a very narrow belt of dark blue fossiliferous limestone has been found at several places in Sussex and Warren counties. The outcrop area of this variety of limestone is, however, very small. It has been found at Belvidere, on the east side of Manunka-Chunk mountain, near the Warren railroad, in Warren county, at Mains' quarry, near Stillwater, near Newton, and on Jesse G. Roe's land, one-half mile northeast of Branchville, in Sussex county. During the past summer it was found on the Hope road, about one-fourth of a mile west of Johnsonburg, Warren county, but the specimen has not yet been analyzed. There are other localties where it can be found in its true position, between the slate and the magnesian limestone. This

fossiliferous stone differs from the magnesian, in the small per centage of magnesia. It consists essentially of carbonate of lime, and hence, is occasionally termed *pure* limestone The limited outcrops at Upper Longwood and Woodstock forge, in Morris county, belong to this fossiliferous limestone formation.

West of the Kittatinny, or Blue Mountain, in Sussex county, there is limestone, also fossiliferous, but belonging to a more recent geological epoch than that above described. In fact, the limestone of this Delaware river valley, between Carpenter's Point and Walpack Bend, belongs to several epochs, and there is a wide variation in it. The more prominent divisions are Water Lime Group, Lower Helderburg limestone, and Onondago and corniferous limestones. The single member of the first named is generally known as the ribbon limestone. This is found at the eastern base of the ridge of hills (or ridges) which runs through the valley. Higher up, in the face, and on the crest of these ridges, is the Lower Helderberg limestone. This stone is extensively quarried for lime. The most western range, and close to the river are the Onondago and corniferous stone. The Helderberg has several subdivisions, but for their names and characters their full description in the "Geology of New Jersey" must be consulted. The corniferous limestone is so full of chert that in a region so well provided with good stone, as this valley, there is no motive for using it. All of these limestones contain little or no magnesia, as the average of analyses given below indicate.

In Hunterdon county, near new Germantown and Lebanon, and also near Amsterdam and Johnson's Ferry, a *calcareous conglomerate* has been worked for lime. Geologically, this is included with the red shale and sandstone of this part of the state, in the Triassic formation. It varies greatly in composition and in value, on account of the per centage of quartz and other foreign minerals in it. The greatest use of it has been made near New Germantown. It is magnesian. As its area of outcrop is very small, and is confined to these few localities, it can never be of general importance.

Leaving the sedimentary or amorphous limestones, nearly all of which are of some shade of blue or gray, we pass to the *crystalline metamorphic* class, very generally called *white limestones.* These, like the magnesian limestone formation, are separate outcrops, but most of them are of very limited area. The largest and most important of these tracts is that in the Wallkill valley, extending from Sparta northward, to the state line, near Vernon. It lies in the valley, between the main highland ridges and the outlying Pimple hills and Pochuck mountain. From this, southwest, through Sussex and Warren counties, to the Delaware, there is a chain of outcrops—at Pinkneyville, Roseville, Andover, along Jenny Jump mountain, Oxford, Roxburgh, Harmony, and Marble Mountain. Other localities of this rock are at Wynockie, in Passaic

county; Turkey mountain near Montville, and Sander's farm near Mendham, in Morris county. No description applicable to the stone of these several localities can be given; but, generally, it is gray to white, more or less crystalline in structure, and includes mica, graphite, chrysotile, and other minerals. The per centage of foreign matter is not so uniformly distributed through it as in the blue limestones. And much of it contains less of these than are found in the blue stone, although in many places it is very impure, owing to the rock in it. Geologically, it is the blue, altered or metamorphosed. While the greater portion of the blue limestone of our state belongs to the magnesian type or class, on the contrary, most of the *white*, or crystalline, contains little, or only traces of magnesia. Some of the stone near Sparta and Ogdensburg is, however, a true dolomite, as can be seen in the analysis given below. The tracts of this rock outcrop in Sussex and Warren counties are near those of the blue, magnesian stone, and as the latter has been generally preferred for burning into lime, the crystalline stone has been neglected, excepting at a few points, as at Raub's, near Oxford, Warren county; and at Hamburg, in Sussex county. Its use, about Franklin Furnace and Hamburg, is increasing, but as there are few points where it occurs along railroad lines, it is not likely to be used as widely as the former.

Near Franklin Furnace, the Homestead Company has two large perpetual kilns. One of them is a Page's patent kiln, and is forty feet high and ten feet in diameter, and with fire chambers at the side. Wood is used as fuel in this kiln. This company can burn one hundred barrels of lime daily. But most of their product is for building purposes. At Hamburg, the Wallkill Cement and Lime Company burn lime, using white limestone. At McAfee Valley, Rosewall and Beardslee also use this stone for lime. These manufacturers are thus introducing the crystalline limestone or "white marble lime." Their market is along the New Jersey Midland and Sussex railroads. At Sparta, J. B. Titman and J. H. Crawford have tried this limestone, and made good lime. In Warren county, very little of this stone has been used for making lime, excepting on Philip Raub's and E. J. Faulkener's farms, near Oxford, and a few kilns made at the *marble* quarry at Lower Harmony. An increased amount of lime from this white limestone is anticipated, as a result of the experiments now in progress, and the comparative merits of this and the bluestone lime ought to be settled.

Statistics, showing the amount of lime used in the state, are not at hand, but, from the statements of farmers and those in the business of lime burning, the total product of the larger kilns is not greater than it was some years ago nor is the amount used by our farmers materially greater. Probably more lime is used in Warren than in any other county. This is, of course, due to the large area of limestone outcrop distributed throughout the county, and the

very general use of lime among the farmers of this county. And, in spite of the general dullness of the times, the use of lime is not diminishing, the farmers finding it necessary to the production of large crops and profitable farm management. Lime has a large use in Hunterdon and Somerset counties, which are well supplied by the railroads, that carry it from the kilns along their lines. The outcrop area of blue magnesian limestome, in Sussex county is quite as great as in Warren county. In addition to this there is the pure limestone, west of the Kittatinny or Blue Mountain, and the white, crystalline limestone along the valley of the Wallkill. Notwithstanding this extent of limestone outcrop a comparatively small amount of lime is used by the farmers of that county. The product of the several kilns, which burn lime for market, is rapidly increasing, but most of it goes out of the county, and is sold for manufacturing mortar and other purposes. It would be interesting to know exactly how much lime the Sussex county farmers apply upon their lands, and how the amount compares with that used twenty or thirty years ago. Judging from the number of old kilns not now in working order, and from the prevailing sentiment against the value of lime in agriculture, the amount used must be very small and much less than in either of the counties named above, if not less than in any other county in the state. In this comparison it must be stated that Sussex county is largely devoted to dairy farming, and the area under tillage is comparatively small. The amount burned west of the Kittatinny Mountain, in the valley of the Delaware, is less than it was a few years ago. Mr. Nearpass says that, formerly, he sold 30,000 bushels a year. This locality is now occupied by Sanford Nearpass, but his sales are not so large. The more generous use of lime in the agriculture of this county is an important question to its farmers, particularly to those who do more in the way of tillage than in pasturage. And possibly the example of Warren might be instructive. In Passaic and Bergen counties very little lime is used, even less than in former years. Within a few years past several quarries have been left idle, diminishing the home supply of this cheap fertilizer, and causing serious inconvenience and loss to the farmers of these districts. This is particularly true of West Milford and Pompton townships, excepting along the N. J. Midland and Montclair Midland Railways, which now bring lime into these and Morris county from Franklin, Hamburg and Deckertown. In Morris county there is considerable lime used, coming from the limestone of the Musconetcong Valley, German Valley, Peapack and Pottersville, and some over the Morris and Essex Railroad. The completion of the High Bridge and Chester Railroad will bring cheap lime from Warren county, not only along its route, but also enable it to be sold at lower rates throughout the portions of the county bordering the main line of the Morris and Essex Railroad.

The central part of the state is already well supplied with facilities for getting good and cheap lime, either from the north and west, by rail transportation, or from the kilns along the Hudson river, by boats. The most of the latter comes from Rondout, New York. It is a strong and good article, and is liked by farmers. It is not magnesian. This lime goes southward along our coast wherever navigation can carry it, and it competes successfully for the market all along the coast. Lime, burned at New Hope, Pennsylvania, (opposite Lambertville, on the Delaware river,) sells at a low price at many points in this part of the state. It is magnesian, but the per centage of magnesia is less than in our ordinary blue (magnesian) limestones.

The western part of the State south of Trenton, is easily reached by railroad communication, from the kilns on the Upper Delaware, and these here find a good and quite large market, although owing to its nearness to the marl-beds, and the large surface devoted to truck farming, lime is not so important a fertilizer as it is in the central portion of the State. Throughout the green-sand marl belt of the State, comprising the most fertile and richest portions of Monmouth, Burlington, Gloucester and Salem counties, the marl, which is so extensively and generally used, supplies the needed calcareous matter to the soil, and the farmers buy very little stone lime. Wherever these marls are rich in carbonate of lime, quick lime does not seem to produce any effect. Upon some of the red soils lying on the red sand bed (of the marl series) it does good, and also when used with the dry-bank or red marls, which contain little lime. Southeast of the marl belt in Cumberland county, a calcareous shell marl, which is dug near Shiloh and Jericho, is carted by the farmers for a few miles around. This, too, supplies the soil with lime. In the wide and sandy belt bordering the marl, and reaching nearly to the coast, the area of tilled land is confined to the small isolated patches of heavier clay loam soils, and these, as well as the rich lands near the shore of Delaware bay and the banked meadows of this part of the State, are all near navigable waters, and accessible to limes in that way. But the amount applied upon these soils is small.

The composition of the limestones of the different outcrops is hereto appended. In most cases, averages of several analyses of stone from different parts of the tract, or outcrop, are given, as representing them better than single analyses. They will enable our farmers who buy lime, to make their own comparisons, and together with careful experiments, form correct conclusions. Following the list of these analyses, a tabular exhibit of these representative analyses is given for ease of comparison, and convenience of reference. It will be understood that these are presented as fairly representing the several tracts, or outcrops. Besides these, there are other and smaller outcrops which are not included in this

list and table. Most of these are of local importance only, and the stone from them is not, in most cases, equal to that of the larger areas or districts. Additional analyses will be found in the Geology of New Jersey, pp. 387–413, and in the annual reports for 1872 and 1873.

ANALYSES OF LIMESTONES.

PEAPACK LIMESTONE—SOMERSET COUNTY.

Lime	30.9
Magnesia	18.3
Carbonic acid	44.6
Alumina and oxide of iron	2.4
Silicic acid and quartz	2.8
	99.0

This is an average of the best blue limestone quarried at Peapack. It is a true *dolomitic* or magnesian stone. The analysis shows five per cent. of foreign matter. This stone is so well known to the farmers of Somerset and Warren counties, that nothing need here be said of it.

CLINTON LIMESTONE—HUNTERDON COUNTY.

Lime	27.1
Magnesia	15.7
Carbonic acid	44.2
Alumina and oxide of iron	4.0
Silicic acid and quartz	7.3
	98.3

This is an average of three analyses of specimens representative of the stone which is burned in the vicinity of Clinton. This, like the Peapack stone is *dolomitic* or magnesian. The wide circle of country around Clinton, which uses this lime, is evidence of the value placed upon it.

MUSCONETCONG VALLEY, WARREN COUNTY.

Limestone from the quarry of James Riddle, New Hampton, Warren county.

Lime	29.8
Magnesia	19.9
Carbonic acid	45.4
Alumina and oxide of iron	1.0
Silicic acid and quartz	3.4
	99.5

This stone furnishes a large amount of lime for the country about New Hampton. The analysis shows less than five per cent. of foreign matter, (oxide of iron, quartz, &c,)

POHATCONG VALLEY, WARREN COUNTY.

Lime	30.0
Magnesia	19.4
Carbonic acid	44.5
Alumina and oxide of iron	1.4
Silicic acid and quartz	3.6
	98.9

This is an average of analyses of limestone from Springtown and the Warren quarries, near Phillipsburg, along the Delaware river. The per centages of the several constituents agrees very closely with the Musconetcong valley stone, and they show a comparatively small amount of foreign matters. The lime and magnesia stand in a ratio corresponding to that of a true dolomite. And this agrees closely with analyses of limestone from Belvidere and Columbia, also in this county. And it is safe to say that these figures represent the composition of most of the stone which is quarried along the Delaware river, near Riegelsville and Carpentersville.

WEST MILFORD LIMESTONE, PASSAIC COUNTY.

Lime	29.5
Magnesia	20.3
Carbonic acid	45.5
Alumina and oxide of iron	2.0
Silicic acid and quartz	1.9
	99.2

The above figures show the average composition of the stone from Gould's & Cisco's quarries. They are, as they indicate, superior magnesian limestones.

BLUE LIMESTONES, WANTAGE AND VERNON TOWNSHIPS, SUSSEX COUNTY.

Lime	29.2
Magnesia	18.4
Carbonic acid	43.2
Alumina and oxide of iron	1.4
Silicic acid and quartz	6.7
	98.9

This is the average of seven analyses of limestones from the valley of the Wallkill, north of Hamburg and West of the Pochuck mountain. There is very little difference in the per centages of these constituents in the several specimens, and they all belong to the ordinary, typical magnesian class.

FOSSILIFEROUS LIMESTONE. WARREN AND SUSSEX COUNTIES.

Lime	51.0
Magnesia	1.3
Carbonic acid	41.8
Alumina and oxide of iron	1.5
Silicic acid and quartz	3.9
	99.5

This is an average of five analyses of limestone from Belvidere, Stillwater, Newton and Branchville. The variation among them is slight, and this represents their composition. And this shows about 90 per cent. of carbonate of lime, whereas, in the magnesian stone there is only about 52 per cent. If *lime* be *more valuable* than *magnesia* then their *fossiliferous* stone is so much the more valuable.

LIMESTONE OF THE LOWER HELDERBERG EPOCH.

Lime	47.9
Magnesia	0.6
Carbonic acid	38.5
Alumina and oxide of iron	2.1
Silicic acid and quartz	9.8
	98.9

This is the average of three analyses of stone from quarries in Montague, Sandyston and Walpack townships, Sussex county. This rock forms the eastern face and a part of the crest of the ridge which runs parallel to the Kittatinny or Blue Mountain from the State line at Carpenter's Point to Walpack Bend.

The average of three analyses of the *quarry stone* at Wm. Nearpass' bank, near Carpenter's Point, is as follows:

Lime	52.3
Magnesia	0.6
Carbonic acid	41.3
Alumina and oxide of iron	1.0
Silicic acid and quartz	4.5
	99.7

In this stone the carbonate of lime is 93.4 per cent. of the whole, while the magnesia is only one-tenth of one per cent. Hence it is a very pure, blue limestone.

The corniferous or cherty limestone, which crops out along the bank of the Delaware river, west of the ridge of Lower Helderberg rocks, is not so pure, the best specimens yielding, on analysis, over

ten per cent. of silica and quartz. The large amount of chert in it renders it siliceous and undesirable for lime-burning, wherever good stone is generally accessible.

CRYSTALLINE LIMESTONE FROM THE CRANBERRY RESERVOIR, APPLEGET'S QUARRY, ANDOVER, AND THE HILL NEAR PINCKNEYVILLE, SUSSEX CO.

Average of four analyses, all of which closely resemble one another in composition:

Lime	53.3
Magnesia	2.0
Carbonic acid	43.6
Alumina and oxide of iron	0.9
Silica and insoluble matter	0.4
	100.2

They contain very little foreign matter.

CRYSTALLINE (WHITE) LIMESTONE, FROM SPARTA, WEST VERNON, HARDYSTONVILLE, AND NORTH VERNON, SUSSEX COUNTY.

The average of five analyses is as follows:

Lime	52.6
Magnesia	1.8
Carbonic acid	43.3
Alumina and oxide of iron	0.5
Silica, quartz, graphite, &c.	0.9
	99.1

As the differences between the several samples is small, this average fairly represents them, and a large outcrop of this crystalline—white limestone. The very small amount (less than 1.5 per cent.) of foreign matter in these is remarkable.

CRYSTALLINE, (WHITE AND MAGNESIAN,) LIMESTONE, WALLKILL VALLEY, SUSSEX COUNTY.

Lime	29.0
Magnesia	19.1
Carbonic acid	43.8
Alumina and oxide of iron	2.3
Silica, quartz, graphite, &c.	5.0
	99.2

An average of two analyses; of stone from near Sparta and near the zinc mines, Ogdensburg. The magnesia and lime here are to one another as in a true dolomite. These figures show more foreign matters. But there is much variation in the amount of rock, mica, graphite, &c., even in the limits of a single quarry.

LIMESTONE FROM MANNINGTON TOWNSHIP, SALEM COUNTY.

Lime	38.98
Magnesia	1.81
Carbonic acid	32.62
Alumina and oxide of iron	3.98
Silicic acid and quartz	23.31
	100.70

This analysis gives the composition of the yellow limestone which is found in the marl belt of Burlington, Camden, Gloucester and Salem counties. Geologically it belongs to the middle green-sand marl bed. Associated with these stony layers there is much loose, sandy material, made up of calcareous matter and green-sand granules. The average composition of this so-called *limesand* is as follows:

Lime	39.12
Magnesia	1.27
Alumina and oxide of iron	4.16
Silicic acid and quartz	19.52

As will be observed, this stone has little magnesia in it. The large amount of silicic acid and quartz is owing to the sand mixed with the calcareous matter.

OYSTER SHELLS.

Lime	44.4
Magnesia	1.3
Carbonic acid	35.4
Alumina and oxide of iron	
Silicic acid and quartz	
Water	14.5
	95.6
Organic matter	3.1
Chlorine	0.4
Sulphuric acid	0.6
Total	99.7

This is an analysis of the fresh shells of an oyster, carefully washed. The average of a pile would yield more foreign matter, (sand, &c.,) and not quite so much carbonate of lime. The removal of the water and organic matter in burning would, however, compensate for an increase in the *dirt* of the heap, and the lime ought to be a strong and quite pure lime, especially well suited by its small per centages of sulphuric acid, alkalies and phosphoric acid,

for agricultural uses. It has the reputation of being superior to stone lime, and it is said it can be applied in larger amounts per acre, without injury.

Besides the limestones in the northwestern part of the State, shell marl and calcareous sinter or travertin are found at several points. These deposits are all of limited area, not generally more than a few acres in extent, and the marls are always found under the muck surface of wet meadows or along the shores of shallow ponds. The calcareous sinter or travertin is the deposit of spring water, and only two localities are known where it occurs in workable amount. The shell marl localities which have been discovered, are all in Warren and Sussex counties, and they are described in the "Geology of New Jersey," pp. 170–172, and 474–480. The composition of these marls is shown by the following average of three analyses of samples, from Isaac Bonnell's farm in Montague and Job J. Decker's lands near Andover, both in Sussex county:

Lime	50.2
Magnesia	1.3
Alumina and oxide of iron	2.1
Carbonic acid	38.6
Water and organic matter	6.1
Sand	.6
	98.89

The sinter has more sand mixed with it, the marl being remarkably free from sand or any foreign matters. The above figures show little magnesia. Wherever these calcareous marls have been applied to the soil good and lasting results have been observed. The lasting beneficial results from the use of manures containing carbonate of lime is well-known, and these are almost exclusively carbonate of lime. The more extended use of these marls is desirable. And the agriculture of the Delaware river valley would certainly be improved by using them. From the permanent improvements produced by the use of the calcareous greensand marls of Monmouth county the farmers of Sussex might well learn a valuable lesson and copy their example in a generous use of these shell marls and calcareous deposits.

GAS LIME.

The lime from gas houses which has been used in the purification of the gas, and which is known as *gas lime*, is sold at a low price to farmers in the vicinity of cities and the larger towns. During the past few years its use has rapidly increased, largely taking the place of

common lime. The composition varies considerably, depending upon the character of the original lime, and also upon its subsequent treatment and the length of time which it is exposed to the air. This will appear from analyses here appended:

	1	2	3	4
Lime	44.24	48.49	32.39	31.16
Magnesia	.72	.61	19.40	23.20
Carbonic acid	33.60	32.90	11.05	22.45
Alumina and oxide of iron	1.65	2.20	6.17	3.73
Sand and insoluble matters	6.40	2.90	1.61	.90
Water	4.80	1.50	3.50	1.00
Potash and soda	.90	.55	.80	Trace.
Ammonia	.54	.28	.27	.41
Hypo-sulphurous acid	.85	5.83	3.04	.67
Sulphurous acid	.09	None.	3.22	1.60
Sulphur (combined as sulphide)	.05	None.	None.	None.
Volatile matter	5.41	4.42	18.02	14.07
Sulpho-cyanides	Trace.	Trace.	Trace.	None.
Total	99.25	99.68	99.47	99.19

1. Oyster-shell lime, fresh from the gas purifiers, New Brunswick gas-works.
2. Oyster-shell lime, (Somerville gas-works) which had been exposed to the weather two years after it was taken from the purifiers,
3. Magnesian lime, fresh from the purifiers, Newton.
4. Magnesian lime, that had been exposed to the weather for a year or more, from Newton.

Much of the fertilizing effect of gas lime has been ascribed to the sulphate of lime which it was supposed to contain, but the analyses show that this is not the case, as there is little, if any, of this lime compound in it. They show, however, a large per centage—more than one-half of the whole—of carbonate of lime. And as this compound is one chemically prepared, in the exposure to the gas and air, by the absorption of carbonic acid, it is *very* fine, resembling calcareous and shell marls in this respect, and like them a lasting and valuable fertilizer. The sulphur compounds are not so well understood in their action in the soil. They evidently undergo some changes when exposed to the air, and hence the probability that the improvement in gas lime as a fertilizer by exposure, is owing to such changes. When applied in large quantity on crops, it has been known to do them harm, especially, if fresh from the purifiers. After exposure it is more mild in its action. As the lime is here combined with carbonic acid *gas lime* cannot be expected to act fully as a substitute for ordinary stone lime. It is no longer a *reagent*, decomposing and forming new combinations, but rather a calcareous marl, acting as carbonate of lime rather than as a lime. The gas-works of New York and Philadelphia use oyster-shell lime, and the lime is preferred by farmers to magnesian *gas lime*. In neither case is it as valuable to the farmer as common lime, and generally the price is much lower.

TABLE OF ANALYSES OF LIMESTONES AND CALCAREOUS MARLS.

	Peapack Limestone.		Clinton Limestone.	Musconetcong Valley.	Pohatcong Valley.	West Milford, Passaic county.	Wantage and Vernon townships.	Fossiliferous (Trenton) Limestone.	Lower Helderberg (Pentameus) Limestone.	Lower Helderberg (quarry) Limestone.	Crystalline Limestone, (Andover, Roseville, &c.)	Crystalline Limestone, (Valley of Wallkill, &c.)	Crystalline Limestone, Sparta, Ogdensburg.	Yellow Limestone and Limesand.	Oyster Shells.	Shell Marl, Sussex county.
Lime.....	30.9	27.1		29.85	30.0	29.5	29.2	51.0	47.9	52.3	53.3	52.6	29.0	39.0	44.0	50.2
Magnesia.....	18 3	15.7		19.9	19.4	20.3	18.4	1.3	0.6	0.1	2.0	1.8	19.1	1.5	1.3	1.3
Carbonic acid.....	44.6	44.2		45.4	44.5	45.5	43.2	41.8	38.5	41.3	43.6	43.3	43.8	.....	.....	38.6
Alumina and oxide of iron....	2.4	4.0		1.0	1.4	2.0	1.4	1.5	2.1	1.0	0.9	0.5	2.3	4.1	35.4	2.1
Silicic acid and quartz.....	2.8	7.3		3.4	3.6	1.9	6.7	3.9	9.8	4.5	0.4	0.9	5.0	21.4	.....	0.6
Total constituents determined.	99.0	98.3		99.5	98.9	99.2	98.5	99.5	98.9	99.2	100.2	99.1	99.2			

HISTORY AND EFFECTS OF THE USE OF LIME FOR MANURE, IN AND ADJACENT TO THE MUSCONETCONG VALLEY, IN THE COUNTIES OF WARREN, MORRIS, AND HUNTERDON. BY HON. AARON ROBERTSON, BEATYESTOWN.

Lime was not generally used for manure before 1820; it had been used on a very small scale by the farmers on Schooley's mountain, in Morris county, for several years before that period, with almost marvelously beneficial effects, but the poverty of the farmers whose land had been reduced to sterility by constant cropping without any effectual system of renovation, and the extremely laborious and expensive method of preparing or procuring it, prevented its use to the extent dictated, by the judgment and experience of all who had used it.

At that time it was burned entirely with wood. The Schooley's mountain farmer generally built a small kiln on his farm, holding not more than from 500 to 800 bushels. He procured the limestone at a quarry in the Musconetcong valley, paying from three to five dollars for sufficient stone to fill his kiln, unquarried, hauled it to his farm, elevated 400 or 500 feet above the quarry, a distance of from three to five miles, making two or three trips per day with a team, and hauling sufficient stone at a load, with four horses, to make twenty bushels of lime. He cut and prepared the wood on his farm, using from fifteen to twenty cords of wood, nearly seasoned, to burn a kiln of the size stated, and requiring the constant and severe labor of two able-bodied men for from seventy-two to eighty-four successive hours in burning. He then hauled it on his land, usually after plowing, and placed it in small heaps of a bushel each, and when slaked by the action of the air or rain, spread it evenly over the ground.

If he could purchase the lime in the valley it was still more expensive, because scarcely a person there then burned lime for sale, and the price previous to 1820 was from twenty to twenty-five cents per bushel. The manufacture in the valley being expensive, because the wood must be hauled from the mountain, at great labor and expense. However the palpable benefits, in process of time, increased both the ability and the disposition to use it, and the consumption has increased from that time to this, with the result that the annual production of the Schooley's mountain farms is little below that of the farms in the Musconetcong valley.

For several years before 1820, the farmers on the limestone and slate lands in the valley, believed that they could maintain their farms in a condition of increasing fertility by the free use of gypsum and judicious farming without the use of lime, with the benefits of which on their soil they were then only partially acquainted, but they did not farm judiciously, and used gypsum extravagantly, and by 1820 found that it had lost much of its beneficial effect, and agriculture being then in its lowest state of pecuniary depression,

farmers were compelled to resort to some means of improving their condition, and began to use lime generally and extensively, with great benefit, and have continued to use it to a greater extent up to this time.

Until about 1850 the manufacture of lime in the valley was also expensive and laborious, wood being still used for burning, and their farms having long been stripped of timber, they must procure it at great expense from the mountains.

About 1850 anthracite coal began to come into general use for burning lime, and it is now exclusively used for that purpose, and the change in fuel has reduced the cost of lime to a very low point. In the vicinity of Beattystown, three miles south-west of Hacketts-town, the regular price of unslaked lime, at the kiln, now is ten cents per bushel, and it is sometimes sold at nine cents. On some farms in that vicinity, all circumstances being favorable with quarries on the farm, it has been manufactured at an actual cost of not more than six cents per bushel, reckoning the value of the lime-stone unquarried at nothing.

The farmers on the mountain, or any point distant from the quarries, now buy the lime of the manufacturers near the quarries, of whom there are plenty, and thus save the transportation of one-half the weight of the stone.

The proper quantity to be applied at one time to the acre on Schooley's mountain and other lands, underlaid by the gneiss rock, is about sixty bushels. On the limestone and clay lands in the valley, about fifty bushels, and on the slate ridge running through the middle of the valley, about forty bushels, all unslacked, with a renewal of the same quantities three times in succession, at intervals of five years, the land to be properly farmed, clover used to the fullest extent, and not cropped closely.

Some of the effects of lime, especially on the land underlaid by the gneiss rock, are marvellous. The use of lime on the farm, on the head springs of the Pohatkong, underlaid by that rock, was begun in 1819. Gypsum had lost much of its power, and although the land was not overworked, it had become very poor. A field on the east end of the farm about two miles from Hackettstown, had been sown with buckwheat, about 1816, in an ordinarily fair season, and only produced 85 bushels from 17 acres. The field was reduced to 15 acres by changing a fence, about 1821. About 60 bushels of unslacked lime was applied to the acre, rye was sown and produced an excellent crop, the field then lay one year in clover, and produced perhaps five times as much as it would have done without lime. The sod was plowed up the next season, 9 acres planted with corn, and produced 450 bushels of shelled corn, and the remaining six acres which were rough and stony, produced 150 bushels of buck-wheat. The next spring oats and clover seed were sown, and the crop was fully equal to the previous one.

Another field on the same farm in a tough sod, principally of blue grass, was plowed in August in an extreme drought, the ground was harrowed until entirely mellow. Lime was applied heavily, the ground sown with rye, and produced an enormously heavy crop. Before the application of lime it would not have produced 20 bushels of corn to the acre. Clover seed was not sown in the rye, because it seldom comes up well when sown on sod only plowed once, it being intended to plant corn on the rye stubble, but after harvest a growth of white clover and blue grass sprang up, which, in burden, exceeded the best crop of red clover, and was kept for pasture the next summer, and then planted with corn, which produced more than 50 bushels per acre.

Lime was applied at the rate of about 60 bushels per acre to another field adjoining the foregoing about the same time, which was then sown with wheat, which, from the effects of a hard winter and the Hessian fly, was about half a crop. Clover seed was sown in the wheat, and within a month after harvest the young clover was at least two feet high, and the field was as completely covered with blossoms as is usual, the year after the clover seed is sown.

At that time wheat was but little cultivated, either on the mountains or in the valley, owing to the ravages of the fly, now by the plentiful application of lime the Mediterranean variety will produce on the mountains, nearly as well as in the valleys.

It should here however, be observed, that the beneficial effects of lime on the soils on the gneiss rock, are greater and more palpable than on the limestone soils, on account of the almost total absence of lime in the natural soil of the gneiss.

The inquiry is made to what crops is lime most beneficial, the answer is that properly applied, it is beneficial alike to all if judiciously applied, with the exception of flax, which is now scarcely cultivated at all in this vicinity. Lime furnishes an important element in the ingredients required to form all the plants cultivated for crops, and therefore, furnishes an element of fertility to the soil, which must be beneficial to all plants adapted to it.

The application of too much at one time has an injurious effect on corn, probably from an overcharge in the quantity required for that crop, or from some caustic or mechanical action, but in proper quantities it is as beneficial to that crop as to any other.

Two kinds of corn are planted in this vicinity, one with a round ended grain and a slim stalk; the other, with a long grain dented at the end, and with a coarse thick stalk, and generally a red cob. By overliming, the growth and yield of the former kind will be seriously injured, while the latter kind will be benefited.

With regard to the best mode of applying lime. It can be applied, with the least danger of injury and the greatest benefit to the first crop, by spreading it evenly on a clover sod, in September or October, where corn is to be planted the next spring; but if land

is in fair condition, it may, without danger, be applied on plowed ground at any time that may suit the convenience of the farmer. Its application, when the stable manure is applied, is a judicious one.

In looking back for thirty years, it will be conceded that the average yield of wheat per acre has increased in a greater rate than that of any other grain. This is probably the result of the cultivation of a peculiar kind, which is more hardy, and exempt from injury by insects, instead of the more beneficial effects of lime on that crop.

The extreme scarcity of agricultural labor in this vicinity, has hitherto prevented any general use of lime in composting with muck or other fertilizing substances, which are also nearly as scarce as labor.

It is a well settled principle, that the richer land is, the greater the quantity of lime which may beneficially be applied without danger of injury. It is a pertinent inquiry, in relation to this subject, whether the application of a given quantity of lime *now* is as beneficial as it was at its first application? It probably is not, but that is not because the soil has become overcharged with it, or because the land has been brought to that state by continued use, that the lime has lost its power of exciting production, as was the case with plaster-of-paris. The true cause is, probably, bad farming. To obtain the full beneficial effects of lime, it should be applied to a soil that contains a large quantity of vegetable matter, the stalks and roots of clover, barn-yard manure, or other substances of that kind, upon which it may act.

The grain farmers, in this region, have found it very profitable, for the last twenty years, to keep a considerable stock of sheep and cows; and the annual profit of five or six dollars per head on sheep, and the annual sale of four or five cows at high prices, have been a great temptation to overstock their farms.

On a grain farm, where there is no waste land, sheep are especially destructive to the grass crop. Early in the spring, they must have pasture, and the only land where they can be pastured is the clover sod, upon which corn is to be planted; this is plowed in April. Nothing then remains but the corn stubbles, which are to be fallowed. These soon fail, and the farmer is compelled to turn them into the clover pastures before these have grown, and, by feeding them too soon, prevents a vigorous growth for the whole season, and the usual consequence is, that in the fall his pasture fields are as bare as a public highway; and lime applied to land in that condition, has nothing to act upon but the bare soil.

The injury of lime to flax has been barely hinted at. If applied in proper quantities to benefit any crop of grain or grass, it will nearly destroy the growth of both flax and flax-seed.

In the valley of the Pequest, and all of Warren county north-

west of it, lime has not been generally used; but it might be used with great benefit. By continued farming, that land has contracted an acidity which shows itself in a growth of sorrel, which the application of thirty bushels of lime to the acre will correct entirely, with manifest advantage to the land in other respects. And, to conclude, there is probably little land in Northern New Jersey that would not be materially benefited by its liberal application. It is a safe and reasonable assumption, that the annual production of the valley of the Musconetcong and the mountains adjacent, is now double what it would have been, if lime had never been used.

The diminished effects of lime, resulting from over-pasturing, has been suggested. The remedy is now an important consideration, and can only be reached by a complete change in the practice of farmers, and the adoption of, and adherence to, a judicious system of rotation of crops. For forty years past, farming has been carried on without system, or, at least, with a frequent change of method. At one time the farmer would sow half his farm with wheat, making that his only market crop; plowing up his clover field the next year after the clover seed was sown, and planting all the corn cultivated on wheat stubble fields where clover had been plowed under the next spring, after the harvest was gathered; sometimes sowing wheat two years in immediate succession on fallow ground, that had been manured with barn-yard manure.

A failure of the wheat crop would occur from the season, or the insect; and when that was attended by a failure of the corn crop, whichseldom grew well on stubble, the farmer was left without a crop, and driven into the adoption of a new plan, which, like all expedients resorted to under compulsion, was seldom a good one.

The only regular system that has been pursued to any material extent, in this vicinity, is the four fallow system, under which one-fourth of the farm would always be in wheat,corn, grass, and fallow respectively, with the exception that one-half of the fallow would generally be sown with oats, and planted with potatoes, and the barn-yard manure applied heavily to that half.

This system, with the propensity of the farmer to keep live stock, is not a good one, because the quantity of grass is insufficient, and also because the crops, especially corn, follow each other too rapidly. It may be assumed as a certainty that the farmers will continue to keep nearly as large a live stock as they now do, and also that, under the present scarcity and expense of agricultural labor, they will not resort to the cultivation of root crops, the preparation of composts, or any other thing that would much increase the amount of labor required.

Under all these conditions, perhaps, the best thing that can be done, is the adoption of a strict five-fallow system, under which two-fifths, or sixty acres of a farm of one hundred and fifty acres, would every spring be in grass, ready to be mown or pastured, besides

thirty acres of wheat stubble that might be moderately pastured after harvest; thirty acres would be in wheat, and thirty acres would be planted with corn, and thirty acres would be fallow, on one half of which oats and potatoes might be cultivated in the same manner as in the four fallow system; the barn-yard manure to be applied to the fallows, clover seed to be sown in the whole of the wheat in the spring, and timothy seed sown with one half the wheat in the fall.

The experience of all who have tested the matter proves that corn produces much better at intervals of five years than four. It is also evident, to all judicious practical farmers, that the benefit to the land from the grass crops is greater when it remains two years undisturbed than when it is plowed the second year. But the great advantage is the large addition to the grass crop, and the increased quantity of vegetable matter in the soil to be acted on by the lime.

When Peruvian Guano was comparatively cheap, and free from suspicion of adulteration, it was used to the extent of two or three tons a year by some farmers, principally on wheat, with great benefit to the wheat crop and the clover sown with it, but with scarcely any apparent effect on any crop sown afterward.

Super-phosphate of lime has had still less permanently beneficial effect, and the only agent which has permanently increased the fertility of the soil, beside barn-yard manure, is lime.

With a five-fallow-system, forty sheep, eight cows and twelve young cattle, besides the working stock of horses and mules, can be kept on a good farm of one hundred and fifty acres, with abundant fodder and sufficient pasture, which much exceeds the quantity that can be well or profitably kept under any other system.

Plaster is used to perhaps less than half the extent it was in 1820, but still, as a top dressing of fifty to sixty pounds to the acre, is valuable on the current crop of both clover and corn. But owing to the vicious habit, above alluded to, of pasturing the clover too early and too much, it has little if any tendency to permanently fertilize the soil.

Plowing under green crops of clover as a preparation for wheat has been considered a very judicious and certain mode of enriching land. A good crop of wheat is generally produced, but the permanent benefit is questionable. Clover seed, sown with that kind of preparation, often will not *take* or grow at all, and always grows more feebly than on fallow ground, besides the land is apt to become boggy from the blue grass, not subdued by plowing.

The mention of one of the material benefits of lime was entirely omitted. That is the tenacity that it gives the soil. It is often remarked by experienced farmers that land is not in good condition unless it shows the marks of the harrow at harvest. Land that has been long tilled without lime will become entirely flat by the action of rain. A proper application of lime will correct that immediately.

A. R.

ON THE USE OF LIME ON THE RED SHALE SOILS OF SOMERSET COUNTY.

BY PETER A. VOORHEES, ESQ., OF FRANKLIN PARK.

I was one of the first of those who, some forty-five years ago, began to use lime, carting it by the load from Peapack, twenty-two miles distant, and those of us who used it then, found it to pay us well. But after the Delaware and Raritan canal was opened, some forty years ago, it was brought near us, so that all our farmers, from that time to the present, have used it extensively, and its results have been the improvement of our farms not only, but a large increase of all our cereal crops, and the yield of our crops of grass, both for pasture and hay, has abundantly paid us for both the labor and cost of its use.

I use about forty bushels of slaked lime to the acre, or, in other words, I think one hundred bushels of slaked lime, sufficient to cover three acres of ground; but, as that is quite a thin dressing, I find my men use forty bushels, which covers it well.

I spread it upon the sod in the fall, on the field that will come in corn eighteen months after its application, thus giving it time to incorporate itself with the soil, so as to be ready for the crop of corn. Thus there is no danger of deep plowing covering the lime too deep for the corn crop; as I have several times, when I applied it in the fall, and plowed it the next spring for corn, lost its effects upon the crop by its being plowed in too deep. Besides, I find that it pays in the increased crop of grass the season following the top-dressing.

Lime will benefit all our crops. It acts most speedily on a crop of buckwheat. Corn will be improved much by liming the ground after it is plowed, or even after it is planted; thus by mixing the lime with the soil, corn crops will be improved. Liming our fallow ground before sowing wheat, will not improve the wheat crop much, unless manure is used to quicken it (for lime alone sometimes will keep the straw green and injure the crop) but the benefit will be found in grass and following crops, for lime will benefit the clover crop not only, but seems to fit the soil to bear a heavy crop of grass.

A few years ago I abandoned the use of lime, supposing that I had used enough to fill the soil, and used the fertilizers of the day, but I soon found that did not pay, so I returned to the old method of using lime, and am well paid for its use. I know of no disadvantage, either to the soil or the crops, if the lime is properly applied.

Lime can be used in composting, and pays well upon the wheat and grass crops. In composting, I plow up some ridge of land, or cart the soil, and mix the soil and lime with manure, and then turn it over once or twice, mixing it well. It will pay in the wheat

crop not only, but the grass would tell me, too, where it had been used; but, then, this method requires extra labor, and I do it but seldom.

Plaster was the great fertilizer for clover, and when I began the use of lime, it seemed as though plaster lost its effect, for I found where I had limed, plaster did me no good for several years. But, after a time, I began its use again, and if the season was good the clover crop would be too coarse and heavy, and difficult to gather. But I think the last few dry seasons, if we had used plaster, it would have paid us; but as plaster acted mostly upon the clover crop, and did not benefit timothy so much, so in our present day, the high price of hay, that is, good timothy hay, (for our clover crops have been cut off by hard springs and dry summers) our farmers wish to improve our timothy meadows, instead of our clover fields, so as to have marketable hay. These are the main reasons why plaster is not used. But I think it would pay us well to use a little more plaster upon our grass fields." P. A. V.

LIME AS A FERTILIZER. BY DAVID PETIT, ESQ., OF SALEM.

Lime has been used as a fertilizer in this section of our state about fifty years, and with greatly varied results. On some land no benefit has been received from an application of it, but on most lands it has proved beneficial, and on some its effects have been wonderful—in the increased production of the crops. A few examples of which I will give as follows:

About forty years ago I discovered a bed of soft limestone, most of which the frosts of winter would pulverize, (overlying the middle green sand marl bed,) with loose calcareous earth between the layers. To test the value of this as a fertilizer, I hauled a small load on some light, loamy land covered with sorrel, and spread around as far as I could throw with a shovel. The result was that every spear of sorrel disappeared soon after, so far as the lime and calcareous earth were spread.

I covered a part of my wheat field about the same time, after seeding with the same kind of materials, and some of the land being naturally heavy, it corrected that heavy nature and improved the land, so that the yield of wheat, on the part limed, was fully double of that on the part not limed. Seeing such marked results, I was induced to cover the farm land over soon after with from ten to twenty loads to the acre of twenty bushels each, equal to forty bushels each of slaked lime to the load, when the sorrel soon after disappeared, and I have heard no complaint since of the land or the frost heaving out the crops. When covering a grass field, one land was left through the middle without any lime. This could be seen afterwards at a considerable distance, with four inches of snow on the ground, by the poverty grass extending up several inches above

the snow, while the part limed was clear of it. The land varied from a light loam to a fine clay, and has been permanently improved by the application.

About this time I tried as an experiment, an application of twenty loads to the acre of the soft limestone and calcareous earth, with twenty loads of green-sand marl on the poorest clay land I had, (which would barely pay for farming,) and they raised that land immediately to a good state of fertility without any other fertilizers of any kind.

About twenty-five years ago I had a field of the out-cropping of the middle green-sand marl bed covered with Pennsylvania, slaked lime, one hundred bushels to the acre, just before seeding with wheat. I was advised not do so—that it would injure the crop, for lime applied directly to the wheat crop would prevent its ripening, and cause it to rust. But the land being of a dark color and early, the crop was good, without rust, and I had a good stand of young grass; but the next year, the action of the lime with or upon the marl (although it was the poor out-cropping) was strong on the young clover—gave it such an impetus in growth that it shot up above the timothy, then fell and smothered out the timothy long before the mowing time, in places, in others where the growth was not so strong, there was a heavy crop of both clover and timothy.

It has not been an uncommon occurrence with me to have the timothy smothered out by an extra growth of clover after a good dressing of marl.

An elderly man, and a good farmer, came to me in the field at hay time, and said, "he had known that land for fifty years, and it had been poor and almost bare all that time, and if any one had told him that it could have been made to produce such a crop, he could not have believed it." This wonderful change made, would seem to indicate that the poor out-cropping of the green-sand marl might be composted with slaked lime to advantage. There is an abundance of it, and very easy of access in many places across the counties of Salem, Gloucester, Camden, Burlington and Monmouth. These out-croppings have been exposed to the rains for ages—to wash out and carry off their soluble and fertilizing properties, which have made them almost barren; but an application of lime acting on the marl must have changed some of its constituents and made them fertile, for the action of lime alone on the crops could not have produced such results.

Another field in the out cropping, or rather the soil was partly so, was covered with slaked lime also, and seeded with oats, which made the increase wonderful from a small load of oats and straw, or less to the acre, as it had formerly done, to a crop quite as large as was grown on the best of land, and the land was permanently improved for years after.

On a field of twelve acres adjoining, but beyond the out-cropping of the marl, and a loamy soil, one thousand two-horse loads of mud deposit were applied—eighty loads to the acre—and spread evenly—covering the land. This mud deposit had been thrown out by a dredge in cutting a water course three miles long through tide meadow. The field was then cropped for several years, and although the mud was good, but little benefit was received until covered with calcareous earth from between the layers of limestone; since then the result has been very satisfactory. This improvement I attribute mostly to the action of the lime on the mud, as it was with the green-sand out-cropping, because when lime has been applied to our banked meadows, it always improves them in productiveness, and restores their fertility after being reduced by hard cropping; besides, experiments have shown that this deposit will bear large quantities of slaked lime without injury to it or the crops. William G. Woodnutt, of this city, a few years ago dug up one-third of an acre of high meadow, and covered with slaked lime, then plowed and covered again, then cross-plowed and covered again, &c., and harrowed to pulverize well, until he applied nine hundred bushels for a compost for low meadow; but not having time to haul it that spring, he planted it with corn, and he reported to our club that the corn was not at all injured by the lime, but greatly improved, for it was the greenest and had the rankest growth of any he had seen, and so continued throughout the season, and turned out well. Nine hundred bushels on fifty-three and one-third rods (one-third of an acre) will make nearly seventeen bushels to the rod, which will cover the land an inch deep. If the land was plowed six inches deep, it would make the compost one-seventh lime. The result of this compost, when applied to lower, banked meadow, was very satisfactory.

Composts made of these materials where they can be had readily and cheaply, will no doubt make valuable fertilizers, but the proper proportion to mix them and the amount to apply per acre to produce the best results, is a question that should be determined by properly authorized experiments under the patronage of the State to give them credence, and published for the benefit of the farming interest, and through that to the State, (as all other industries are dependent on the farming), and may, in this way, add greatly to its wealth.

These deposits are unlimited in quantity for practical purposes, as they cover nearly 300,000 acres of land in this State, and lie in 15 of our 21 counties, so that they are accessible to the people of a large part of our State, and much of them beyond the reach of marl, which is too costly in freight to pay to move great distances.

Pennsylvania lime and our native limestone burned, are now used extensively, and the calcareous earth between the layers of the lat-

ter is much more used than formerly, and will be more yet, when its value becomes better known.

About 20 years ago, I deposited a heap of this calcareous earth, (which was dug about eight feet underground, just above the green-sand marl,) in a field to be sown with wheat. Accidentally in sowing, one grain fell on this heap and took root, about three feet above the sod. It started out rapidly in the fall and more the next spring, so that at harvest time there were 105 straws with 60 grains to a head, making over 6,000 grains. The whole stool was taken to the printing office, and the result published. This would seem to show that there is everything in that calcareous earth the wheat crop needs.

I have never know any ill effects from lime, except when too much slaked lime has been applied at one time on upland, but this cannot be lasting. Gas lime has been used by a few farmers with satisfactory results, but not having used any, I cannot particularize.

While I was farming I used plaster freely, which always paid me better for the outlay than any other fertilizer for the improvement of the land; the cost is so small to the acre, and the fertilizer so easily applied.

Along the river and bay shore, it is said plaster is of no use, and when lime has been used freely it is said to be of no use. These are important questions and should be experimented on and settled, so that farmers may know its value and where to apply it to recover the most benefit, and not continue to make unnecessary outlays for fertilizers, which will not profit them. D. P.

ON THE USE OF LIME. BY OMAR BORTON, PRESIDENT OF THE WEST JERSEY AGRICULTURAL AND HORTICULTURAL ASSOCIATION, WOODSTOWN, SALEM COUNTY.

Our farmers are using lime freely, much of it being quarried in Mannington, (a kind of sand limestone,) and burned there. Shell lime is also furnished at Salem and Swedesboro, and it is much used. Formerly, stone lime was brought from Pennsylvania.

The quantity used per acre, is from 40 to 60 bushels of slaked lime. Our farmers quite agree as to its benefits on stubble, after harvesting. One of our most intelligent and successful farmers, tells me he found great results from putting it upon his grazing field, and he contemplates giving it another dressing soon. He also says, he found direct benefit from spreading it upon sod, after breaking up. Many use it thus: the strips of land where the lime lay in rows were plowed, lime and sod under together. No result here, till after years. Lime is also put upon potato ground after plowing. In fact, its use seems to be narrowed down to this: get the lime on.

They do not compost, except muck, &c.

Injury has been done by using lime too freely, injuring the crops for some years.

Plaster is little used with us. It was much used when they first began sowing clover seed, but now, with the use of marl, there is not much to be gained by its use.

Some of our people think the use of both marl and lime at the same time, better than either alone, which I do not doubt in some condition of land or marl, or both.

ON THE USE OF LIME ON SOILS IN THE MARL DISTRICT OF MONMOUTH COUNTY. BY WM. STATESIR, ESQ., OF FREEHOLD.

I used lime almost entirely, brought from different points up the Hudson river, and applied about seventy-five bushels to the acre. For corn or potatoes I generally applied it in the spring after plowing. Some prefer applying it in the fall and winter, and thus save cartage in the spring. I tried it both ways, but could notice no difference in the yield of corn or potatoes; but there would be a perceptible difference, when I failed to apply any. The most striking improvement that I ever noticed was when I gave a dressing of bank marl and an application of lime on wheat ground before sowing; the marl being deficient in lime, but possessing other fertilizing qualities necessary.

I am confident it is injurious to apply a very heavy coat of lime at one dressing. I have noticed where there has been a quantity thrown on a heap, and not been taken up sufficiently clean, the wheat would remain green, and rust, and be worthless.

I could not say as to the permanent effects of lime alone. I used marl on the same ground, and can speak definitely as to that. Where I first used marl and lime on the same place, I could see it plainly, twenty years after, in the crops.

I never used lime in composts, preferring marl.

I have used plaster, but never could see any benefit from it, although I have seen it applied to corn after it was growing, when some rows that were left without plaster did not yield more than half as much, as where plastered. I tried the same way and saw no benefit. I presume the reason why it has been discontinued so generally, in this section, is the abundant supply of marl, and its unmistakable results. W. S.

GREEN-SAND MARL.

This abundant and invaluable fertilizer continues to be used in large quantities, wherever it can be obtained at reasonable prices. It has been pretty fully described in former reports, and a number of analyses can be found in the annual report of this board for the

year 1873, pp. 39–41. It has been the source of wealth in all those counties where it could be got easily, and, in the period when New Jersey agriculture was at its lowest grade, these marls were the first and most successful agents for improving the soil.

MANUFACTURE OF FISH GUANO. BY DR. THEO. T. PRICE, OF TUCKERTON.

I have recently made inquiries of the fish-guano manufacturers for the purpose of obtaining the information which you desire.

For three years past, until this year, three establishments for the manufacture of fish guano have been in operation in this vicinity. The largest was removed last spring to some place on the New England coast.

Of the factories now in operation here, one is managed by Mr. James E. Otis, formerly of Saybrook, Conn., the other by Captain Cyrus W. Smith, formerly of Patchogue, Long Island. Mr. Otis manufactures, on an average, 350 tons guano per year. He has already made (August 20) 360 tons this year. Captain Smith makes about 300 tons per year.

This so-called guano is *fish scraps*, i. e. the bones, flesh, scales and other refuse of fish, after having been parboiled, and subjected to heavy pressure to extract the oil. It is analogous to the dry pumice of a cider press.

The *scraps*, when squeezed dry, are heaped together under large sheds, with sulphate of lime sprinkled through the mass, to prevent too much fermentation, and to destroy maggots, which would seriously waste the heap.

This is the only manipulation at the factories, and the material is sold and shipped in that condition to farmers direct, and to dealers. When shipped it is usually packed in bags or barrels, and weighed, the price varying from $15 to $18 per ton, at the factories. Large quantities are purchased by *fertilizer makers*, who grind it to powder, and probably adulterate it with various inert substances, such as charcoal, to hold the ammonia, or combine it with other stimulating articles and sell it under other names.

When used in its pure state, as purchased from the manufacturers, the average quantity per acre to produce a good yield of any crop, is three-fourths of a ton. Mr. Otis informs me that the farmers along the Delaware river use less, about 1200 pounds per acre. It is thought to pay best when composted with muck or rich soil, before applying.

In the manufacture there is a waste from the presses which flows off with the oil. The fish after being partly boiled, are laded from the cauldrons directly into the presses, from which flows, with the oil, water, blood and a gelatinous fluid.

When separated from the oil this waste is composted with salt mud, or the drift *debris* of the bays, which accumulates in small coves and sheltered places, and which is called by our bay-men by the expressive names of *jumble or coffee grounds.*

This compost is a very good fertilizer and is sold at the factories at $6 per ton. From three to four tons per acre is the quantity used, and will produce fine crops. It is not so valuable for distant transportation as the guano, on account of greater bulk.

The manufacture of *fish guano* and *oil* is, doubtless, a profitable industry, and is pobably capable of vast increase. The most of the fishing is done at sea; averaging three miles from shore. The smacks go out of the inlet in the morning towing the skiffs, on which the nets are coiled, and when a *school* of fish is discovered (which is easily done, if they are in the vicinity, as they swim near the surface) the skiffs are manned, and the nets are *laid around* it, closing together and enveloping the fish in the purse-like bag. The nets are called *purse nets* and draw together at the bottom, like a reticule. The fish are gathered into the skiffs with small hooped nets, like crab nets.

This part of the work, or sport, is rather exciting with the boats rocking on the billows, the water alive with fish drawn in small compass by the ends of the net having been drawn together, jumping, skipping, splashing in the water and in the boats, and each man working with all his might to save as many as possible.

The supply is probably inexhaustible; the kind caught are the "Menhaden" or "Moss-banker," which, like the herring, is exceedingly prolific.

The average number of fish required to make a ton of scraps is 10,000; the oil from this number will be from two and a-half to five gallons, according to the fatness of the fish. There is quite a difference in this respect, the fish being much more oily at certain seasons of the year than at other. They cost at the factories from one dollar to one dollar and twenty-five cents per thousand. The oil is sold at the factories at an average price of forty cents per gallon, and is an excellent and cheap substitute for linseed oil, for painting buildings, farm implements, &c. T. T. P.

The following tabular statement of the value of this industry in our county is copied from the New York Tribune:

Menhaden Oil and Guano—The great magnitude of the interest connected with the manufacture of oil and guano from the menhaden has, as in other cases, induced the formation of an association for mutual protection, under the title of "The United States Menhaden Oil and Guano Association." The statistics of capture of menhaden and the manufacture of oil and guano, are shown by the following table:

	Barrels.
Number of fish caught during 1874	1,478,634
Number of fish caught during 1873	1,193,100
Making an increase of	285,534
	Tons.
Amount of guano in 1874	50,976
Amount of guano in 1873	36,290
Increase for 1874	14,686

	Gallons.
Quantity of oil manufactured in 1874	3,372,837
Quantity of oil manufactured in 1873	2,214,800
Increase for 1874	1,158,037

The number of barrels, as given above, would be equal to the following number of fish:

Fish caught in 1874	492,878,000
Fish caught in 1873	397,700,000
Increase in 1874 over 1873	95,178,000

The amount of oil on hand at the beginning of the year was 648,000 gallons, and 5,200 tons of guano remained unsold. The number of fishermen returned for 1874 was 1,567; the number of men employed at the manufactories, 871; the number of sailing vessels employed, 283; steamers, 25. There is a capital of $2,500,000 invested in the business, with 64 factories. A market has been found in the West Indies and in England for the guano.

FOREST AND FOREST CULTURE.

BY PROF. J. C. SMOCK.

No survey of a country, which has for its object the symmetrical development of the natural resources of that country, is complete without including within its scope the forests growing within its limits. And a complete system of agriculture, in any district, must also take into account forestry, as one of its leading departments. The consideration of this subject is, therefore, very properly within the bounds of a Report of a State Board of Agriculture. This is but a reiteration of that part of the original plan and scope of the work of this board, as set forth in the introduction to the First Annual Report, which refers to "investigations upon the economy of farm management, as applied to market gardening, farming or forestry; and the proper laying out of a farm into pasture, meadow, tilled land, and woods." The true place of this matter of forestry, in a comprehensive agricultural survey of our state, is again stated, since the tendency of our people is towards its neglect and forgetfulness of its proper importance, due, of course, to the extent of woodland within our limits, and the supposed abundant supply of timber for all immediate wants and the needs of years to come. The proper proportion of wooded and cleared areas, in so far as the character of our climate is affected by them, is considered, by some, as altogether chimerical, and of no practical importance. For the present this part of the subject may be ignored, or its discussion be deferred to future reports, which can command a greater number of facts, and when we have a more thorough acquaintance with the areas, distribution, and character of the forests within the state.

In the First Annual Report of this Board, the area of woodland in the state was estimated to be 2,400,316 acres, or one-half the total (land) area. The distribution of this woodland in the several counties, and also in the several well marked geological divisions, was given on pp. 51–54 of said report. Since that was published, the subject of forestry has been constantly kept in view, in making inquiries in the prosecution of the field work of the geological survey of the state, and some additional facts have been gathered. In the absence of any census since that of 1870, it is not possible to give any more accurate data than those of the first report. The uniform testimony of practical men in the northern part of the state, so far as they have been obtained, confirms these figures, or rather puts the estimate of woodland a little above that of our report. In the southern part of the state there is a greater degree of uncertainty as to accuracy of the United States census returns, and a diversity in the statements of men who are well acquainted with the country. It is to be hoped that, in 1880, the time of the next census, greater care will be taken to collect the agricultural statistics of the states, and thereby give us the correct and full data for generalizations of practical value. The distribution of the woodland in the state is well known to be very unequal, and while the total area is certainly large enough, and probably too large, for the preservation of our climatic features, in the central and north central counties the cleared land is very greatly in excess of the woodlands, and the clearings have reached a limit beyond which it is not safe to advance. In the highlands, and in the broad and sandy belt of the southern part of the state, greater clearing ought not to affect prejudicially the climate, nor disturb the proper ratio of forest to farm land. But in these, the wooded areas are not likely to diminish very rapidly, in consequence of the nature of the surface; in the north, much of it being too rocky for tillage or pasturage, whereas in the south, a large portion of it is too poor for very profitable farming purposes. In the central part of the state, on the contrary, this order is reversed, and the woods are fast disappearing before the advancing farm boundaries. And here the limit has already been reached beyond which clearings must tend to do injury to the whole country. The full discussion of this subject must come soon, and, possibly, some measures be taken to arrest the destruction of its timber belts, and to maintain the equilibrium necessary for the well-being of the country.

But it is timely to investigate the character and value of our forests, and to ask what may be done to improve them, or make our woodland bring in a larger revenue. In this country we are not accustomed to look upon forests or trees as a *crop*. Nature provided grand, primeval forests for the first settlers, so extensive as to be looked upon as "cumberers of the ground," and to be removed as quickly as possible. The successive generations of our population have cut

away until, in this state, but a few groups and single trees are left of the original forest. And, in the course of the past century, the demands of our numerous iron furnaces, glass houses, railroads, and buildings have several times removed the wood of our forests, and to-day the larger part of our woodland is a jungle of saplings, scarcely worthy of the name of forest. It is a fact, that in this *new* country, where a judicious use of our resources should have prevailed, and left much virgin forest, and where trees thrive so well, the general character of our standing timber is not better than that of continental Europe, and its value is correspondingly low. Our farmers and lumbermen are all well aware of this poor quality of our timber, and when choice material is needed, they are compelled to pass beyond our 2,000,000 acres of woodland to get their orders filled. Nearly all of our standing timber is fit for fuel only. That suitable for other and more valuable uses, is but a very small fraction of the whole. In the counties of Sussex, Passaic, Warren and Morris, whose aggregate area in woods exceeds that of farm land, amounting to 470,000 acres, there is very little large timber, in fact, less than in the counties south of them. The average age of the growth in these counties, ranges between twenty and thirty years. In the southern part of the State, where the pine predominates, there is very little old timber. Frequent fires and the demand for wood, have left scarcely any older growths, excepting here and there, a white cedar swamp.

This must, of course, depend upon nature almost entirely, as in our circumstances, forest culture as practised abroad, would not pay here. But much might be done in the choice of our woodland, and in the care of it, in securing more profitable returns from it. According to the census of 1870, the forest products of New Jersey were valued for that year, 1869, at $352,704, which, divided among 2,400,316 acres, would be not quite 15 *cents* per acre. According to the same census, the total products and betterments, (or produce of the cleared land,) amounted to $42,725,198, which, divided among 2,000,000 acres of improved land, gives over 21 *dollars* per acre. It is not expected that woodland would be as productive as farm land, but this difference is very great, and certainly much greater than that between the average valuations put upon these two classes of lands. It is probable that the census returns are much too low, but the same may be said of the farm productions of the *same* census. But suppose we make it tenfold as large, the difference is still great—the one being only the one fourteenth of the other—a fraction still below that expressing the relation between the valuation of the two classes. Leaving the census figures, the general opinion among practical men in northern New Jersey is, that land for raising wood is not worth more than $5.00 per acre. In South Jersey, land for raising pine timber (for fuel,) is valued at $5.00, i. e., it is said to pay interest on that capital. The hard wood lands

of the State pay much more, but there are no accurate accounts kept showing the profits of such lands, excepting the sales of wood when a clearing is made. While some of these are large, amounting in some known instances to $600 an acre, time of growth is not known, nor the value removed from time to time by the occasional felling of single trees. Carefully kept records of original investment, area, rate of growth, character of timber, expenses, interest and sales, are much needed as data, upon which to base definite conclusions concerning the value of timber, as a crop. Now, in farming, the practice is to raise that crop which pays the best, consistent, of course, with other conditions incident to location, and the capabilities of the population. In a well-ordered arrangement of our woodland also, this practice ought to prevail, so far as possible. If circumstances admit, our forests ought to consist of trees which furnish either valuable wood, or those which produce, in a given time, a larger amount.

In nearly all the countries of continental Europe the forests are under government control, and strict police regulations administered through a bureau of forestry and a large number of subordinate officials known as *foresters*. These have supervision of public and to some extent, private woods also. No indiscriminate cutting is permitted, nor grazing of cattle, or other stock allowed within the forests unless under special restrictions. In short, care is taken in the selection and planting of the trees best suited to the soil or most valuable for their wood, and then every precaution is used to keep the growing timber from anything which might retard its growth or diminish its value. These police regulations extend to the location of buildings to be erected near or within the woods, to the roads, pasturage, leaves, moss and litter, fires, charcoal burning, injurious insects, mode of cutting and carrying away the timber, &c., &c. Connected with this governmental supervision there are schools of forestry or institutions in which instruction in the branches useful to these officials is given, and these foresters are trained for their practical duties. There are at this time in Germany and in the Austrian empire fourteen such schools; one in Switzerland, one at Moscow, Russia, one at Nancy, France, and one at Stockholm, in Sweden. Investigations upon all matters relating to the forestry also come within the scope of these schools. As they are liberally supported by government they have done much work of this kind and made forestry a science. Reports of an elaborate character are regularly published, and journals devoted to forest culture are maintained. According to the Annual of the "Bureau de la Revue des Eaux et Forets," Paris, for 1875, the public forests cover an area of about 2,500,000 acres, while that of individuals and corporations amounts to nearly 6,000,000 acres. The receipts from the first-named (public) forests amounted to about $7,500,000, and the expenses to $2,500,000, leaving a bal-

ance of $5,000,000, equivalent to $2 per acre, as net income. According to a letter of H. J. Winser, in the "U. S. Commercial Relations for 1873," the average net income from 98,280 acres of woodland belonging to the government of Meiningen, Germany, for the years 1866–70 was $2.02 in gold per annum. This is given as a good example of the profits of government management of forests in Germany. According to a recent report of the Danish forests the receipts amounted to $3.25 per acre.

In this State the large returns per acre from white cedar swamps and from locust woods, are well known. Single acres in Monmouth county have been known to yield over $2,000 worth of timber. But these are exceptional cases. The average net value or income produced per acre from all our woodland would not be equal to that of either of the foreign countries mentioned above. That greater attention to our *native* forests would increase the value of our forest products is very evident, but how near they would approach the *cultivated* and carefully attended forests of Europe is not plain. Our soil and climate and valuable timber trees, especially our hard woods, and our nearness to markets, are all favorable to us.

In some of the western and northwestern states, where the timber supply is quite scarce, legislative aid has been granted, in the way of exemption of taxation, or bounties to those successfully raising a given number of trees, or planting a certain area with forest for a specified term of years. Very much has been done, and thousands of acres have been planted in Kansas, Iowa and Nebraska, so that treeless prairies are being broken by timber belts. These serve as valuable, ameliorating agents upon the climate, sheltering man and beast, and also supplying the lack of wood immediately necessary to the settler. In this state no such legislation is necessary, nor is any official supervision of our forests, in accordance with our democratic ideas of government, but with the rapidly increasing demand for wood in so many ways, and the destruction by fires that destroy, annually, $1,000,000 worth of timber in the state, a careful economy of our forest wealth is eminently advisable, so as to make each acre of *wood land*, as well as each acre of *farm land*, yield the largest and most valuable returns, thereby increasing our capital and our yearly income.

COLORADO POTATO BUG.

The very general appearance of the Colorado potato bugs, or beetles, (Diophora decem-lineata,) in all parts of the state, and their ravages, have been the subject of much discussion, and have brought forth many suggestions for their destruction, and the saving of the most valuable crop of our farmers. Paris green has been used extensively and with effect, although some have been deterred from using it on account of its supposed poisoning of the potato, through

the introduction of arsenic, one of the elements of this chemical compound. The fear of poison from this source has been entertained by a large part of our city population, so much so that stringent legislation has been suggested to prevent the farmers from using it. That this fear is unfounded has been proved by the chemical examination of potatoes grown where Paris green had been applied, and no *traces* of arsenic could be found. The Department of Agriculture reports such cases, and the failure to detect any poison. In New Jersey a careful analysis of potatoes and parings has been made, at the state laboratory, but no arsenic was found in them. The treatment they received is described by Mr. F. S. Gaskill of New Egypt, who raised them. His letter, to which his affidavit is attached, is as follows: "I had a patch of half an acre of Early Rose; planted them first of May. When the first bugs made their appearance I picked them off. On the 12th of June I discovered that the young bugs were very numerous. I mixed twenty pounds of land plaster with one pound of Paris green, and sprinkled with perforated tin cans while the dew was on the vines. There being so many bugs, I thought it necessary to get it on all the vines, and in doing so a considerable quantity of it fell through upon the ground. Consequently, we got over but a few rows when our mixture was all gone. I counted the rows and found I had gone over but one tenth of an acre. In a few days I found the vines badly burned, or eaten by the Paris green.

"There were no more bugs on those vines until just before they were dug which was done on the twentieth of July. But on all the rest of the patch, right up to these rows, the bugs were very thick. The potatoes that I sent you I dug from these rows myself, upon which the Paris green had been sprinkled.

"Respectfully yours,

"F. S. GASKILL."

ON DISEASES OF CATTLE AND SWINE IN BURLINGTON COUNTY, IN 1875.

BY JAMES LIPPINCOTT, OF MOUNT HOLLY.

So far as I have been able to learn, the hog disease, to any noticeable extent, first appeared in this region in two or three neighborhoods, in the easterly part of this county (Burlington) and the westerly part of Monmouth county, about eighteen months or two years ago, and then carried off a large number. In those instances the prevailing symptoms were vomiting and diarrhœa, under which the subject very rapidly sank and died, with very few recoveries.

During the last summer and autumn, a disease appeared among the hogs, both old and young, in the townships of Southampton and Medford, and destroyed between three hundred and four hundred,

some of which were nearly fat enough for slaughtering. One farmer lost ninety-seven hogs and large pigs.

In this appearance of the disease, the symptoms generally commenced with loss of appetite, staring coats, weakness in the back, causing the loss of the use of the hind legs. In some cases only one leg, (either fore or hind) would appear to be paralyzed, and with few exceptions, the whole run of the disease would be characterized with rigid constipation of the bowels, and their contents, after death, were found to be very dry and hard, which led Dr. Wm. S. Vansant, a veterinary surgeon of large and successful practice here, to pronounce the immediate cause to be indigestion. There were very few recoveries—one farmer had sixty-two in number, the disease killed fifty-nine. Two were sick and recovered, and only one escaped entirely.

Some of the circumstances would seem to indicate that the disease was either infectious or contagious, but in other instances it could not be traced to either, but appeared to be endemic.

The pleuro pneumonia among cattle, visited seven farms in this county last summer and fall, that I know of, and there may be some that I have not heard of. The deaths were about fifty. Some of the sick ones recovered. One farmer lost thirteen out of a herd of twenty-six cows. But the loss in deaths is only a part. The disease was carried to five of the farms by cows that were bought at the Philadelphia cattle yards, showing the great danger of making new purchases.

Another disease among cattle, called the Texas fever, has caused much loss to the farmers of this county during the last two summers; one man sustained a loss of $600 by buying cattle at Philadelphia that were, soon after the purchase, taken with this disease a few days after getting them home; recoveries, it is said are very uncommon.

It is believed by some, that this disease is produced by western cattle pasturing in fields that have, a short time previously, been occupied by Texas cattle, infested with ticks that are common to cattle in Texas.

Dr. Vansant states that both of these cattle diseases are less virulent, and not so prevalent in winter as in summer and autumn. In fact, it is stated that with the appearance of frost, the Texas fever entirely subsides.

I hope that the State Board of Agriculture, by collecting information from different parts of the State, will be enabled to devise some plan by which the farmers will be rid of the great liability to loss that now clouds their prospects. J. L.

CRANBERRY ROT AND SCALD.

Thus far the efforts of the New Jersey Cranberry Association, to discover a remedy for the rot, have been unsuccessful. Liming has not appeared to be in any degree effective. Both in regard to the malady and in the cure or preventives suggested, there is a very wide range of opinion, based upon observations of localities having very great differences of condition. Some growers have attributed it to a fermentation going on in the peaty subsoil or old swamp or pond bottoms, causing the roots to become diseased and the fruit to rot. Others have supposed it to be due to stagnant water on badly drained bogs, or to an insufficient or irregular supply of cool water during the hot weather, and consequent exposure to extreme solar heat. The mode of culture has also been considered as a source of disease, and it has been asserted that on natural bogs, the cranberry was healthy and productive. But the exceptions to all these hypotheses are so numerous that no one of them is considered a satisfactory cause. The application of mineral manures has been proposed and particularly that of quick lime, which would sweeten the soil, and prevent the sour fermentation. During the past year, lime has been carefully tried, but without any perceptible effect. So, too, the commercial manures do not, as yet, appear to have prevented rotting.

The scald is very often confounded with the rot, both by the growers and the scientific authorities, by whom these have been treated. It is quite different, and seems to be caused by extreme solar heat during the summer, when the vines are not protected by cool water.

The use of lime has been suggested in the preparation of the bog, mixing it with the peaty or muck subsoil, thereby securing a more energetic action of the lime than can occur when the lime is applied on the surface of the growing bog. A similar mode of applying other mineral manures might also be of advantage. But no suggestions or theories are availing against the facts of the practical grower, and these suggestions are given with much hesitancy, in view of the careful and intelligent culture which this crop is receiving in the hands of energetic and persevering cranberry growers. However, the yield is large, and there is plenty of room for experiment; and besides the importance of the crop as one of the staples of our more modern agriculture, is such as to call forth the attention of scientific investigation, and the patient skill of our most practical men.

The area of cranberry ground is increasing from year to year, and this larger acreage of bog for the year just closed, more than makes up the deficit due to the rot, although this has been worse than ever before. The healthy bogs have been very productive.

The prices are firm and remunerative, owing to the light crop in New England and the West. Our location, near the markets, is an advantage. And the large area of land, suited to the cranberry, which is yet unoccupied, would, if this rot could be stopped, soon be made to add to the wealth brought within our borders by this fruit.

A NEW METHOD OF DRIVING THE CUTTER BAR OF MOWING AND REAPING MCHINES.

At a meeting of the Middlesex County Farmers' Club, held at New Brunswick, December 6th, 1875, W. Farr Goodwin exhibited a new mowing machine of his own invention. It had been in use in various places, during the past summer; and he claimed for it that it required much less power to drive it, than any other machine yet invented; and that its cost was only from a half to two-thirds as much as that of the best kinds now in use. He tested the force required to drive it by means of weights and a pulley; and in the whole exhibition he left upon the minds of the farmers an impression that he had invented a new and very valuable improvement upon the mowing machine. The club will make some trials with it in comparison with other approved machines, as soon as the proper season comes round. Wm. E. Kelly read the following paper, containing a detailed description of the principles upon which this machine was constructed:

Mr. President and Members of the Middlesex County Farmers' Club:—I have been requested to make a few remarks explanatory of a new mechanical movement which has recently come under my notice, but more particularly to call your attention to its application to mowing machines. This mechanical movement is for the purpose of converting rotary motion into rectilinear motion, which it does in an extremely simple and effective manner. That it has not been discovered and applied before, seems strange, as the elements used are of the simplest kind. A vast amount of labor and capital has been expended on the mowing machine, in the endeavor to simplify its construction and lessen its cost to the farmer, and so great has been the success of these efforts, that we have been inclined to look on it, as now made, as almost beyond the reach of improvement. As a class, it is one of the best developed machines we now have. Any real improvements, therefore, made at this time, must be of great value. I think I can demonstrate to you to-day, that such an improvement has been made. The objective point in the construction of a mowing machine is to cut the greatest amount of grass or grain in a given time, with the least amount of power; or, if you have a given amount of power, then to cut the greatest amount of grass in a given time. Now, if we can, by any mechanical appliances, reduce the loss by friction to a minimum, and transmit

the power from the driving-wheels to the cutter-bar, with less loss of power by friction than in other machines, we have gained a great improvement, and one which will be appreciated by all intelligent farmers. This, it is claimed, has been accomplished in the mowing machine shown you to-day.

Without further introductory remarks, I will proceed to explain, as best I can, the new mechanical movement invented by Mr. Wm. Farr Goodwin. I trust my limited command of language will enable me to convey to you a clear and distinct idea of the principles involved. You have always understood that an acute angled wedge, when driven into most substances, after the driving power is removed, would retain its position and hold all it has gained, while a lever would bound back, and if used in lifting a weight, would cause it to be lowered when the power at the end of the lever was removed. Now an obtuse angled wedge will not retain its position after the driving power is removed, but if force is applied to the side of the substance in contact with the sides of the wedge, the wedge will be ejected from the opening. This principle of the obtuse wedge is made use of in this new movement to convert rotary into reciprocating motion. A wedge is simply a double inclined plane, and we may define a screw to be a revolving inclined plane, so that the inventor has very appropriately called the combination "a reciprocating screw." You all understand the working of the ordinary bolt and nut. In this, a continuous rotary motion of the nut in one direction will give a rectilinear motion to the bolt if the bolt is kept from rotating but in only one direction. Now in order to get a rectilinear motion of the bolt in the opposite direction, and still have the nut revolve in the same direction as before, you will have to reverse the direction of the threads; and if in the first case we had a right hand screw, in the second case we should have a left hand screw. This is the principle involved in this new movement. The pattern for the one now before you was made as follows, which I will explain by this model. A cylinder of wood 8 inches in diameter is laid out with 19 right and 19 left hand threads around its circumference. This pattern would be used in a reaper. These threads will of course cross each other and form 19 points of intersection. By following the right and left hand threads from each of these points, we get a line of intersection. If we should pass a plane through each line of intersection perpendicular to the axis of the cylinder, we would virtually cut the cylinder into two pieces, and the section would present 19 corrugations, or V shaped grooves, and corresponding projections radiating from the centre to the points where the right and left hand threads intersect. A section of the nut is made in the same manner, and of course corresponds exactly with the section of the bolt. The section made from the bolt has a sleeve cast on one side of it. This sleeve fits loosely around the axle and

serves to transmit motion from the inside of the nut to the lever. The sections being all alike, the bolt section is fitted in between the two nut sections in the same manner as the bolt is fitted in the ordinary nut in a common jack screw. One section of the nut has a hub by which it is fastened to the main axle, and rotates with it. The other section of the nut is on the opposite side of the bolt section, and rotates with the first-mentioned nut section, being fastened to it by means of a rim, a band and bolt; as before mentioned the bolt section is placed between the two nut sections, and enclosed in a cylindrical box formed by the two nut sections and the band joining them together. The hub or sleeve of the bolt section passes through an opening in one of the nut sections, and is fastened to a lever. The motion of the bolt section is therefore communicated to the lever, and through it conveyed to the end of the sickle or knife of the mowing machine. It is obvious that by this combination of the right and left hand screws into one, a reciprocation of the internal section or bolt is obtained by the continuous rotation, in one direction of the two outer sections or nuts, provided the bolt is secured from revolving, but still permitted to vibrate in line with the axis of the nut. The axle is secured from moving in the direction of its axis by flanges or collars bearing against the framing.

We recognize the principle of the screw in this mechanical movement, from the fact that its rotation is concentric with its axis, while its reciprocating motion is parallel with its axis of rotation, and all the threads or grooves are in full bearing equally all around its centre at the same time. This gives an equal distribution of power on every part of the circumference. As before mentioned, the bolt section must be made secure from rotation, and this is done by means of a crosshead attached to the outer end of the sleeve. The ends of the crosshead are turned cylindrical, and are really used as a sort of journal bearing, to which the lever is attached, and by which it is operated. The fulcrum of the lever is attached to the main frame of the machine at a point five inches behind the centre of the axle. The lever is thirty inches long, and the power being applied between the fulcrum and the point of resistance, at a distance of twenty-five inches from the resistance, and five inches from the fulcrum, we have a leverage of five to one. Again, as the power is applied between the fulcrum and the point of resistance, a movement of one-half an inch at the point of application of the power will give us a movement of three inches at the point of resistance. The point of resistance of the lever therefore travels six times the distance that the bolt section moves; the movement in the mowing machine now before you is made up of twenty-three right and twenty-three left-hand threads, consequently we have forty-six cuts of the knife to every revolution of the driving wheels. The circumference of the driving wheels on the machine before you

is eighty-five inches. The machine, therefore, would advance that distance for every revolution of the driving wheels, and the knife would travel a distance of one hundred and thirty-eight inches. Another point of peculiarity consists in the use of India rubber buffers. These pieces of rubber are entirely independent of the motive power, and are placed in a part of the framing, so that the lever, near where it is fastened to the knife will strike them at about the end of its stroke, and very greatly assist in reversing the motion of the lever; and they not only reverse the motion with advantage, but impart some of the one stroke to the next succeeding one, it being a well understood fact that if you project a body against a spring or highly elastic substance, the projected body will recoil with nearly the same force, less the loss by friction and atmospheric resistance. The value of this feature you will better appreciate by trying it with a bar of iron in your hand, moving it between the rubber buffers, and then try to accomplish the same thing without them. Another point of interest is the fact that the entire screw movement is enclosed, as it were, in an air-tight box, and the air contained therein forms an elastic cushion, which materially assists the reciprocating movement of the bolt, causing it to reverse its movement without waiting for direct power from the driving wheel to do it. By placing a little oil or other lubricating substance in this tight box the movement is kept constantly lubricated, and as the oil cannot escape, it is virtually a self-oiling movement.

Having mentioned the principal details, I will state, in general, that there is no part of this moving machine which makes an entire revolution except the driving wheels and axle. Hence there is no rotary motion except the bearings of the axle, and a circular motion of one sixteenth of their circumference of the journal bearings of the lever. You will therefore perceive that by this new movement the rotary motion of the driving wheels is converted into the reciprocating motion of the knife in the most direct and simple manner, and with the least possible friction. In other mowing machines now in the market, the same thing is accomplished by means of gear wheels. But as every journal bearing of these wheels must revolve, and the tendency of the wheels being to separate, we have every journal acting as a friction brake, consuming a great amount of power. With the cutter bar taken out of this machine before you, the entire movement can be started and operated by a power of two pounds applied at the circumference of the driving wheel. This I now show you by actual test.

This mowing machine will not heat and cause loss of time just at the moment when time is the most valuable as the motion is slow on all its bearings. The friction of the screw and nut section is distributed over twenty-three threads, all in contact at the same time, giving a large amount of surface, which, as before stated, runs constantly in oil. The point of greatest velocity in the combina-

tion is at the end of the lever where it connects with the knife. But as this is not a rotary motion, it is not liable to create much friction.

Altogether this movement, as applied to mowing machines, is extremely simple, compact, and strong. It cannot be otherwise than durable; and as there is such a great saving of the applied power, it must be the lightest draught machine now made. The inventor certainly deserves great praise for patiently working out this problem. It is the solution of such problems as this that confers a real benefit on mankind; and I feel sure these important improvements will be fully appreciated by the gentlemen of this club.

APPENDIX.

The following is a partial list of Agricultural and Horticultural Societies in the State:

THE NEW JERSEY STATE AGRICULTURAL SOCIETY.

ORGANIZED, 1855.

President—Hon. Amos Clark, Jr., Elizabeth.
Vice Presidents—Gen. N. N. Halsted, Newark; Hon. N. S. Rue, Fillmore; Gen. John S. Irick, Vincentown.
Recording Secretary—William M. Force, Newark.
Corresponding Secretary—P. T. Quinn, Newark.
Number of Members—350.
Capital invested in Fair Grounds, Buildings, &c., $90,000.

Meetings of the Directors are held on the third Wednesday in June, October and January; annual meeting of the Society, on the third Wednesday in January.

Annual exhibition, at Waverly, Essex county, third week in September, which is very largely attended. An annual report of the meetings and the exhibition is published.

NEW JERSEY CRANBERRY GROWERS' ASSOCIATION.

ORGANIZED APRIL 25, 1873.

President—Rev. Dr. John H. Brakeley, Bordentown.
Vice Presidents—James A. Fenwick, New Lisbon; Dr. E. S. Merriman, Bricksburg.
Secretary and Treasurer—A. J. Rider, Trenton.

Executive Committee—Rev. Dr. J. H. Brakeley, Bordentown; A. J. Rider, Trenton; E. W. Crane, Caldwell; N. R. French, 180 Reade street, N. Y.

Representative in State Board of Agriculture—E. W. Crane, Caldwell.

Statistician—N. R. French, 180 Reade street, N. Y.

Corresponding County Secretaries—Ocean county, Julius Foster, Bricksburg; Burlington county, Theodore Budd, Pemberton; Atlantic county, Geo. F. Miller, Hammonton; Monmouth county, Samuel Conover, Freehold; Middlesex county, F. L. Buckelew, Jamesburg; Camden county, Job Braddock, Haddonfield; Cape May county, Thomas Beasley, Cape May Court House.

Number of Members—107.

The annual meetings are held at Trenton, third Wednesday in January; and annual conventions, first Tuesday in September.

NEW JERSEY STATE HORTICULTURAL SOCIETY.

ORGANIZED AUGUST 17TH, 1875.

President—Prof. Geo. Thurber, 245 Broadway, New York City.

Vice Presidents—A. S. Fuller, Ridgewood, Bergen county, N. J.; C. W. Badger, Newark, N. J.; Jno. Van Doren, Manalapan, Monmouth county, N. J.; Jno. S. Collins, Moorestown, Burlington county, N. J.; Edwin Allen, New Brunswick, Middlesex county, N. J.; Geo. M. Cole, Deerfield, Cumberland county, N. J.; N. W. Parcell, Elizabeth, Union county, N. J.; Ezra Dayton, Bernardsville, Somerset county, N. J.

Recording Secretary—E. Williams, Montclair, Essex county.

Corresponding Secretary—B. B. Hance, Red Bank, Monmouth county.

Treasurer—W. H. Goldsmith, Newark.

Executive Committee—P. T. Quinn, Newark; J. W. Hayes, Newark; S. C. DeCou, Moorestown; Thos. Cole, Deerfield; D. McLaury, New Brunswick.

This society was organized and held its first meeting at New Brunswick, August, 1875. The annual meeting was held in the Geological Hall of Rutgers' College, New Brunswick, January 20th, 1876. The next annual meeting will be held at the same place.

ATLANTIC COUNTY.

EGG HARBOR CITY AGRICULTURAL SOCIETY*—ORGANIZED MARCH 23D, 1859.

President—Charles Kraus, Egg Harbor City.
Vice President—Philip Steigant, Egg Harbor City.
Recording Secretary—Valentine P. Hoffman, Egg Harbor City.
Treasurer—Charles Gruner, Egg Harbor City.
Number of Members—63.
Meetings—First and third Fridays in each month, at the Union Hotel, Egg Harbor City.
Annual Fair—Latter part of September.

ATLANTIC COUNTY AGRICULTURAL ASSOCIATION—ORGANIZED 1874.

BAKERSVILLE AGRICULTURAL CLUB.

FRUIT GROWERS' UNION, HAMMONTON*—ORGANIZED 1868.

President—George F. Saxton, Hammonton.
Secretary—Gerry Valentine, Hammonton.
Other Officers—One Vice President and six Directors.
Number of Members—100.

BURLINGTON COUNTY.

BURLINGTON COUNTY AGRICULTURAL SOCIETY*—ORGANIZED 1846.

President—Samuel Butterworth, Vincentown.
Vice Presidents—William R. Hancock, William M. Risdon, Josiah B. Pew, Clayton H. Dudley.
Recording Secretary—John B. Collins, Mount Holly.
Corresponding Secretary—James Lippincott, Mount Holly.
Treasurer—Edward B. Jones, Mount Holly.
Number of Members—(stockholders)—400.

Meetings—In the Burlington county Lyceum rooms, quarterly, viz.: on the fourth Saturday in January, April, July, and October.
Annual Exhibitions—Generally the first Tuesday and Wednesday of October.

*No report of officers and meetings received since last year's report.

BURLINGTON COUNTY FARMERS' CLUB*—ORGANIZED IN 1871.

President—James Lippincott, Mount Holly.
Vice Presidents—Clayton Zelley, Joseph W. Emley, James Logan.
Secretary—Henry I. Budd, Mount Holly.
Treasurer—Edward L. Bowne.
Number of Members—80

The meetings have been irregular on account of the absorption of members in the granges, a list of which follows this list of agricultural and horticultural societies.

PROGRESSIVE FARMERS' CLUB OF BURLINGTON COUNTY*—ORGANIZED DECEMBER, 1865.

President—William Dunn Rogers, Mount Laurel.
Recording Secretary—Henry C. Herr, Hainesport.
Corresponding Secretary and Treasurer—Mark H. Busby, Masonville.

Meetings—First Monday in each month, at Mount Laurel.
Number of Members—110.

CAMDEN COUNTY.

FARMERS' MUTUAL BENEFIT ASSOCIATION*—ORGANIZED JANUARY, 1872.

President—Joseph C. Hollingshead, Haddonfield.
Vice President—Ezra C. Bell.
Recording Secretary—R. Lewis Shivers.
Corresponding Secretary—Edward Burrough, Merchantville.
Treasurer and Librarian—J. Stokes Coles.
Number of members—35.

Meetings are held regularly, on the last Thursday of each month.

*No report received since the last meeting.

CAPE MAY COUNTY.

CAPE MAY COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY*—ORGANIZED MARCH, 1870.

President—George H. Dare, Seaville.

The annual meeting is held the last Saturday in February, and an exhibition in September.

CAPE MAY AGRICULTURAL SOCIETY*—ORGANIZED APRIL, 1870.

President—Dr. John Wiley, Cape May Court House.
Secretary—John Spaulding, Cape May Court House.
Treasurer—Coleman F. Leaming.
Number of members—50.

Meetings are held in April and July, and an exhibition in September or October.

CUMBERLAND COUNTY.

CUMBERLAND COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED DECEMBER 8, 1851.

President—Charles Woodnut, Shiloh.
Vice Presidents—John S. Holmes, Dr. Samuel G. Cattell, Joseph H. Ogden, Ephraim P. Ayres.
Secretary—Eli E. Rodgers, Bridgeton.
Treasurer—Francis Danzenbaker, Bridgeton.
Number of Members—518.

Annual Meeting—Fourth Wednesday in January.
Annual Exhibition in September. The society is in a prosperous condition.

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* No report of officers received since last meeting.

VINELAND AGRICULTURAL SOCIETY*—ORGANIZED OCTOBER, 1862.

President—S. D. Clark, Vineland.
Recording Secretary—Richard Lush, Vineland.
Corresponding Secretary— ——— ———
Treasurer—Q. Wright, Vineland.
Librarian—William A. Jolly, Vineland.
Number of Members—75.

Meetings are held every Saturday evening; and an agricultural, horticultural, and floricultural fair is held annually.

FLORAL SOCIETY VINELAND*—ORGANIZED 1864–5.

President—Mrs. O. D. Graves, Vineland.
Vice President—Mrs. C. D. Bailey, Vineland.
Secretary—Mrs. L. D. Dyer, Vineland.
Treasurer—Mrs. W. P. Swasey, Vineland.
Number of Members—200.

Meetings weekly. The society is strictly floral, but it unites with the Vineland Agricultural Society in their annual exhibition. A chrysanthemum show is held in the fall of each year.

SOUTHWEST VINELAND FARM AND GARDEN CLUB.

President— ——— ———.
Secretary—C. H. Lewis.

WEST VINELAND FARM AND GARDEN CLUB.

President— ——— ———.
Secretary—G. W. Lewis, Vineland.

GLOUCESTER COUNTY.

WOODBURY FARMERS' CLUB.*

President—Joseph Carter, Woodbury.
Vice President—Daniel J. Packer, Woodbury.
Secretary—Charles W. Knight, Woodbury.
Corresponding Secretary—D. Cooper Andrews, Woodbury.
Treasurer—James Budd, Woodbury.
Number of Members—30.

The meetings have been suspended for some time.

*No reports of officers, meetings, &c., received since last annual report.

UPPER GREENWICH FARMERS' CLUB.

President— ——— ———
Secretary—Thomas D. Brown, Clarksboro'.

HUNTERDON COUNTY.

HUNTERDON COUNTY AGRICULTURAL SOCIETY*—ORGANIZED FEBRUARY 16, 1856.

President—John C. Hopewell, Flemington.
Vice Presidents—Caleb F. Fisher, George F. Crater.
Recording Secretary—John L. Jones, Flemington.
Corresponding Secretary—Richard S. Kuhl, Flemington.
Number of Members—350.

Meetings of stockholders are held on the third Saturday of February, and an exhibition on the Tuesday, Wednesday and Thursday of the last week in September.

UNION FARMERS' CLUB,* MOUNT AIRY.

President—Elisha E. Holcombe, Lambertville.
Vice President—Newton K. Young.
Secretary—F. S. Holcombe.
Treasurer—Gideon M. Brewer.
Number of Members—26

MERCER COUNTY.

THE FARMERS' ASSOCIATION OF PRINCETON*—ORGANIZED IN 1840.

President—Hon. Charles S. Olden, Princeton.
Vice President—Ralph Guild, Princeton.
Secretary—Henry E. Hale, Princeton.
Number of Members—Limited to 20.

Meetings are held once a month, at the houses of the members.

* No reports of officers and meetings received since the publication of the last annual report of this Board.

HOPEWELL FARMERS' CLUB*—ORGANIZED DECEMBER 19, 1868.

President—Ralph Ege, Hopewell.
Vice President—Joseph M. Phillips, Hopewell.
Secretary—John M. Dalrymple, Hopewell.
Treasurer—William I. Phillips.
Number of Members—18.

Meetings are held on the first and third Wednesdays of each month.

MIDDLESEX COUNTY.

MIDDLESEX COUNTY FARMERS' CLUB—ORGANIZED NOV. 12, 1867.

President—James Neilson, New Brunswick.
Vice President— ——— ———
Recording Secretary—George H. Lambert, New Brunswick.
Corresponding Secretary— ——— ———
Treasurer—Dr. A. D. Newell, New Brunswick.
Number of Members—75.

Meetings are held the first Monday of each month.

MONMOUTH COUNTY.

MONMOUTH COUNTY AGRICULTURAL SOCIETY*—ORGANIZED IN 1852.

President—Nathaniel S. Rue, Fillmore.
Vice Presidents—Daniel Conover, Marlborough; Joseph H. Holmes, Holmdel.
Cor. Secretary—John C. Smock, Freehold.
Rec. Secretary—J. J. Conover, "
Treasurer—C. A. Bennett, "
Number of Members—300.

Meetings are held on the third Tuesday in January, and at the time of Exhibition, in September.
Annual Exhibition—Second week in September.

* No report of officers and meetings received this year.

MONMOUTH COUNTY FARMERS' CLUB*—ORGANIZED FEBRUARY 18, 1869.

President—John S. Whitlock, Matawan.
Vice President—Henry Schanck, Freehold.
Secretary—S. E. Thompson, Freehold.
Treasurer—John Dorrance, Freehold.
Number of Members—79.

Meetings are held at Freehold, on the first Tuesday in January, February, March, June, September, and December.

MONMOUTH COUNTY POULTRY ASSOCIATION*—ORGANIZED IN 1873.

President—John Van Mater, Colts Neck.
Secretary—John T. Rosell, Freehold.
Treasurer—D. A. Vanderveer, Manalapan.

Meetings are held quarterly at Freehold, at which essays on poultry are read. An exhibition is held annually, at Freehold, either in December or January. These have attracted much attention, and have done much to improve the stock of poultry in the country. They are open to competitors from all parts of the world.

OCEAN COUNTY.

OCEAN COUNTY AGRICULTURAL SOCIETY.*

President—George Cowperthwaite, Toms River.
Secretary—J. W. Carmichael, Toms River.

SALEM COUNTY.

WEST JERSEY AGRICULTURAL AND HORTICULTURAL ASSOCIATION OF THE COUNTIES OF SALEM AND GLOUCESTER, NEW JERSEY.

President—Omar Borton, Woodstown.
Vice Presidents—John W. Dickinson, Woodstown; Robert Vanmeter, Pittsgrove; D. M. J. Paulding, Daretown; Isaac Scull, Woodstown.

*No report of officers, &c., received since the last meeting.

Secretary—J. Morgan Barnes, Woodstown.
Treasurer—Dr. L. A. D. Allen, Woodstown.
Number of Members—264.

Meetings—The annual meeting is on the third Thursday in January, and a semi-annual meeting, third Thursday of July, at Woodstown.
The next annual exhibition will be Sept. 15th and 16th, 1876.

SALEM COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY,* ORGANIZED IN 1850.

President—R. M. Acton, Salem.
Secretary—David Petit, Salem.

SOMERSET COUNTY.

SOMERSET COUNTY FARMERS' AND MANUFACTURERS' ASSOCIATION*—ORGANIZED JULY 16TH, 1870.

President—Rynier H. Veghte, Somerville.
Vice President—John C. Kenyon.
Secretary—William S. Potter, Somerville.
Treasurer—L. R. Vredenburg, Somerville.
Number of Stockholders—About 600.

The annual meeting of stockholders is held on the third Tuesday of February. The annual fair of the society is held in the first week in October.

UNION COUNTY.

UNION COUNTY FARMERS' CLUB—ORGANIZED DECEMBER 11, 1868.

President—Noah W. Parcell, Union.
Vice President—John Crane, Union.
Secretary—Dennis C. Crane, Roselle.
Treasurer—Ogden Woodruff.
Number of Members—35.

* No report received this year.

Meetings are held in the Court House, Elizabeth, semi-monthly, excepting in the summer. They are informal in character, and the discussions relate to general farm questions. Agricultural papers are taken, and the club has a library.

WARREN COUNTY.

WARREN COUNTY FARMERS', MECHANICS', AND MANUFACTURERS' ASSOCIATION*—ORGANIZED 1859.

President—John V. Deshong, Belvidere.
Secretary—J. T. Kern, Belvidere.
Treasurer—Israel Harris, Belvidere.
Number of Members—60.

The annual meeting is held at Belvidere, the last Friday in December. The annual exhibition takes place at Belvidere on the first Tuesday in October.

The interest in our Agricultural Societies and Farmers Clubs has, to a considerable extent, been transferred to the Farmers' Granges, which have been organized in many parts of the state. The following list of granges and officers has been sent to the Board by Mortimer Whitehead, Esq., of Middlebush, Somerset county.

* No report received this year.

OFFICERS

OF THE

NEW JERSEY STATE GRANGE,

P. OF H., 1875.

Master	Mortimer Whitehead	Middlebush, Somerset County.
Overseer	Jacob M. Harris	Roadstown, Cumberland "
Lecturer	William C. Kates	Woodstown, Salem "
Steward	William S. Taylor	Burlington, Burlington "
Assistant Steward	Joel Horner	Merchantville, Camden "
Chaplain	Rev. Edward Wilson	Metuchen, Middlesex "
Treasurer	Chalkley A. Rulon	Swedesboro, Gloucester "
Secretary	Russell W. Pratt	Newfield, Gloucester "
Gate Keeper	Elisha E. Holcombe	Lambertville, Hunterdon "
Ceres	Mrs. Maye J. Whitehead	Middlebush, Somerset "
Pomona	Mrs. Mary G. Duell	Wenonah, Gloucester "
Flora	Mrs. Anna P. Ridgeway	Hancock's Bridge, Salem "
L. A. S.	Mrs. Hannah C. Holcombe,	Lambertville, Hunterdon "

EXECUTIVE COMMITTEE.

Mortimer Whitehead	Middlebush, Somerset County.
Charles Woodnutt	Shiloh, Cumberland "
John W. Dickinson	Woodstown, Salem "
Sylvester Slater	Lafayette, Sussex "
James Lippincott	Mount Holly, Burlington "
Isaac W. Nicholson	Camden, Camden "

LIST OF SUBORDINATE GRANGES, P. OF H., OF NEW JERSEY, DEC. 20th, 1875.

No.	NAME.	MASTER.	MASTER'S ADDRESS.	SECRETARY.	SECRETARY'S ADDRESS.
1	Pioneer	Zenas Henderson	Stelton, Middlesex Co	Wm. W. Henderson	New Brunswick, Middlesex Co.
2	Marl Ridge	Franklin S. Gaskill	New Egypt, Ocean Co	Thomas B. Jobes	New Egypt, Ocean Co.
3	Hammonton	R. J. Byrnes	Hammonton, Atlantic Co	E. J. Woolley	Hammonton, Atlantic Co.
5	Swedesboro	Joseph R. Black	Swedesboro, Gloucester Co	John T. Howey	Swedesboro, Gloucester Co.
6	Mt. Laurel	Japhet B. Joyce	Moorestown, Burlington Co	Howard Darnell	Mt. Laurel, Burlington Co.
7	Somerset	Peter J. Staats	Boundbrook, Somerset Co	Mortimer Whitehead	Middlebush, Somerset Co.
8	Moorestown	Wm. R. Lippincott	Cinnaminson, Burlington Co	Frank Garrigues	Moorestown, Burlington Co.
9	Woodstown	Wm. C. Kates	Woodstown, Salem Co	Richman Coles	Harrisonville, Gloucester Co.
10	Paulsboro	George H. Gaunt	Paulsboro, Gloucester Co	Edward G. Miller	Paulsboro, Gloucester Co.
11	Vineland	Horace K. Flint	Vineland, Cumberland Co	Mrs. A. C. Bristol	Vineland, Cumberland Co.
12	Ringoes	Elisha E. Holcombe	Lambertville, Hunterdon Co	F. S. Holcombe	Lambertville, Hunterdon Co.
13	Cohansey	Jacob M. Harris	Roadstown, Cumberland Co	Eli E. Rogers	Bridgeton, Cumberland Co.
14	Edgewood	William S. Taylor	Burlington, Burlington Co	John L. Deacon	Burlington, Burlington Co.
15	Newfield	Russell W. Pratt	Newfield, Gloucester Co	Alex. W. Page	Newfield, Gloucester Co.
16	Hopewell	Robert More	Bridgeton, Cumberland Co	J. C. Bowen	Shiloh, Cumberland Co.
17	Harmony	Chas. P. Steward	Cohansey, Cumberland Co	Louis Schaible	Cohansey, Cumberland Co.
18	Cumberland	Geo. W. Sheppard	Greenwich, Cumberland Co	R. P. Ewing	Greenwich, Cumberland Co.
19	Progress	Nathaniel Munday	Orange, Essex Co	Mrs. Laura D. Hopping	Elizabeth, Union Co.
20	Fenwick	Waddington B. Ridgway	Hancock's Bridge, Salem Co	Joseph B. Anderson	Hancock's Bridge, Salem Co.
21	Seaville	Michael Swing	South Seaville, Cape May Co	Wm. Doolittle	Ocean View, Cape May Co.
22	Harlingen	John J. Brokaw	Plainville, Somerset Co	A. S. Hageman	Harlingen, Somerset Co.
23	Frankford	Jacob A. Courson	Branchville, Sussex Co	George Phillips	Branchville, Burlington Co.
24	Union	Edwin J. Osler	Merchantville, Camden Co	Joshua D. Janney	Cinnaminson, Burlington Co.
25	Mannington	A. M. P. V. H. Dickeson	Woodstown, Salem Co	Woodnutt Pettit	Salem, Salem Co.
26	Harrisonville	Samuel Moore	Harrisonville, Gloucester Co	Edwin Starn	Harrisonville, Gloucester Co.
27	Elsinboro	Samuel Powell	Salem, Salem Co	Richard M. Acton, Jr	Salem, Salem Co.
28	Stoe Creek	Isaac W. Elwell	Roadstown, Cumberland Co	Ephraim Mulford	Roadstown, Cumberland Co.
29	Pittsgrove	Henry Coombs	Daretown, Salem Co	Charles F. H. Gray	Pittsgrove, Salem Co.
30	Franklin	Harman Lawrence	Daretown, Salem Co	N. R. N. Emmell	Daretown, Salem Co.
31	Alloway	John M. Kerlin	Allowaystown, Salem Co	Daniel P. Dorrell	Allowaystown, Salem Co.
32	Bridgeport	Samuel B. Gaskill	Bridgeport, Gloucester Co	Charles G. Burk	Bridgeport, Gloucester Co.
33	Lafayette	Sylvester Slater	Lafayette, Sussex Co	Raymond Snyder	Lafayette, Sussex Co.
34	Cedarville	Josias M. Cobb	Cedarville, Cumberland Co	John Rainier	Fairton, Cumberland Co.
35	Quinton	Robert B. Griscom	Qninton, Salem Co	R. M. DuBois	Salem, Salem Co.
36	Medford	David T. Haines	Medford, Burlington Co	Richard Haines	Medford, Burlington Co.
37	Mt. Holly	James Logan	Mt. Holly, Burlington Co	Henry I. Budd	Mt. Holly, Burlington Co.
38	Haddon	Isaac W. Nicholson	Camden, Camden Co	Geo. T. Haines	Haddonfield, Camden Co.
39	Mantua	Chalkley Duell	Wenonah, Gloucester Co	Wm. C. Long	Mantua, Gloucester Co.
40	Lawrence	Geo. W. Johnston	Trenton, Mercer Co	Isaac B. Baker	Lawrence Station, Mercer Co.
41	Auburn	Geo. Lippincott	Auburn, Salem Co	Asa G. Turner	Auburn, Salem Co.
42	Pennsgrove	William Lawrence	Pennsgrove, Salem Co	Charles Leap	Pennsgrove, Salem Co.
43	Hope	E. Sheppard Wallen	Bridgeton, Cumberland Co	E. J. Cook	Bridgeton, Cumberland Co.
44	Branchburg	William J. Dilts	North Branch Depot, Somerset Co	Peter Dumont	North Branch Depot, Somerset Co.
45	Marlton	Joseph Atkinson	Marlton, Burlington Co	Benj. P. Wills	Marlton, Burlington Co.
46	Pedricktown	Samuel M. Hunt	Pedricktown, Salem Co	Samuel M. Layman	Pedricktown, Salem Co.
47	Hamburgh	William H. Edsal	Hamburgh, Sussex Co	John P. Wilson	Hamburgh, Sussex Co.
48	Elwood	David U. Brown	Elwood, Atlantic Co	Mrs. Mary A. Brown	Elwood, Atlantic Co.
49	Rancocas	Joseph Lundy	Rancocas, Burlington Co	J. Barclay Hilyard	Rancocas, Burlington Co.
50	Pemberton	Joseph L. Budd	Pemberton, Burlington Co	Frank Earl	Pemberton, Burlington Co.
51	Mullica Hill	John J. Dunlap	Mullica Hill, Gloucester Co	Frank Iszard	Mullica Hill, Gloucester Co.

52 Deerfield	Charles H. Mickle	Deerfield, Cumberland Co	Joseph D. Cole	Deerfield, Cumberland Co.
53 Pleasant Grove	John S. Woodruff	Bridgeton, Cumberland Co	John T. Garrison	Bridgeton, Cumberland Co.
54 Palatine	William Overs	Elmer, Salem Co	Robert M. Hitchner	Elmer, Salem Co.
55 Mutual	Parent Sharp	Mauricetown, Cumberland Co	Robert Shropshire	Mauricetown, Cumberland Co.
56 Readington	John Runyon	Readington, Hunterdon Co	James Lane	Readington, Hunterdon Co.
57 Centre Grove	Michael S. Everingham	Millville, Cumberland Co	John W. Earl	Millville, Cumberland Co.
58 Columbus	Chas. W. Reeve	Columbus, Burlington Co	Franklin S. Zelley	Jacksonville, Burlington Co.
59 Woodbury	Edward J. Lodge	Woodbury, Gloucester Co	Casper Budd	Woodbury, Gloucester Co.
60 Course's Landing	Clarkson Lippincott	Sharptown, Salem Co	Thomas Stewart	Sharptown, Salem Co.
61 Crosswicks	Alfred Satterthwait	Crosswicks, Burlington Co	Joseph S. Middleton	Crosswicks, Burlington Co.
62 Concord	Elias W. Hewlings	Franklinville, Gloucester Co	James P. Langley	Franklinville, Gloucester Co.
63 Five Points	John S. Rulon	Five Points, Gloucester Co	Frank W. Heritage	Five Points, Gloucester Co.
64 Pennington	Samuel B. Ketcham	Pennington, Mercer Co	Nelson M. Lewis	Pennington, Mercer Co.
66 Millville	A. E. Burcham	Millville, Cumberland Co	Miss Anna Clunn	Millville Comberland Co.
67 Vincentown	Joseph Rogers	Vincentown, Burlington Co	Alfred Budd	Vincentown, Burlington Co.
68 Unionville	John J. Coombs	Unionville, Gloucester Co	Thomas Izard	Clayton, Gloucester Co.
69 Glassboro'	John Repp	Glassboro', Gloucester Co	S. H. Stanger, Jr	Glassboro', Gloucester Co.
70 Newport	Solomon Chambers	Newport, Cumberland Co	R. H. Leaming	Newport, Cumberland Co.
71 South Branch	Stephen Wever	South Branch, Somerset Co	Peter Studiford	South Branch, Somerset Co.
72 Sandyston	Elias H. Roe	Bevans, Sussex Co	John Youngs	Bevans, Sussex Co.
73 Ewing	James B. Green	Greensburg, Mercer Co	Chas. H. Walker	Greensburg, Mercer Co.
74 Mt. Pleasant	Daniel R. Hill	Mt. Pleasant, Hunterdon Co	John Hacket	Mt. Pleasant, Hunterdon Co.
75 Forest Grove	Charles Young	Forest Grove, Gloucester Co	Mrs. V. H. Porter	Forest Grove, Gloucester Co.
76 Milford	J. W. Bloom	Milford, Hunterdon Co	Josiah Clark	Milford, Hunterdon Co.
77 Mercer	Ralph Ege	Hopewell, Mercer Co	W. I. Phillips	Hopewell, Mercer Co.
78 Wantage	A. B. Wilson	Deckertown, Sussex Co	James W. Mc Coy	Deckertown, Sussex Co.
79 Hamilton	James C. Robbins	Hamilton Square, Mercer Co	Azariah Cubberly	Hamilton Square, Mercer Co.
80 Flemington	Geo. B. Stothoff	Flemington, Hunterdon Co	Josiah C. Britton	Flemington, Hunterdon Co.
81 Friesburg	Calvin Dilks	Alloway stown, Salem Co	Wm. A. Miller	Cohansey, Cumberland Co.
82 Walpack	Isaac S. Rundle	Walpack Centre, Sussex Co	John H. Wood	Walpack Centre, Sussex Co.
83 Andover	Wm. M. Iliff	Andover, Sussex Co	Theo. F. Youngs	Andover, Sussex Co.
84 Bethel	John C. Thompson	Hurffville, Gloucester Co	Geo. W. Grier	Hurffville, Gloucester Co.
85 Williamstown	John M. Taggart	Williamstown, Gloucester Co	Joseph J. Ayars	Williamstown, Gloucester Co.
86 Budd's Lake	Lewis Hulse	Budd's Lake, Morris Co	Enos G. Budd	Budd's Lake, Morris Co.
87 South Vineland	John C. Wheeler	South Vineland, Cumberland Co	William C. Pasco	South Vineland, Cumberland Co.
88 Locktown	E. M. Heath	Locktown, Hunterdon Co	H. F. Bodine	Locktown, Cumberland Co.
89 Tabernacle	Arthur Haines	Vincentown, Burlington Co	Joseph B. Woolman	Vincentown, Burlington Co.
90 Blackwood	Hamilton Haines	Kirkwood, Camden Co	Samuel W. Lamb	Blackwoodtown, Camden Co.
91 New Denmark	Immanuel Pfeiffer	New Denmark, Gloucester Co	Edward Pfieffer	New Denmark, Gloucester Co.
92 Monmouth	Gilbert H. Van Mater	Holmdel, Monmouth Co	David D. Denise	Freehold, Monmouth Co.
93 Centennial	John W. Hoag	Waterford, Camden Co	Stephen Badgely	Waterford, Camden Co.
94 Fredon	Wm. S. Hardin	Newton, Sussex Co	Robert M. Hardin	Fredon, Sussex Co.
95 Excelsior	Richard A. Leonard	Leonardsville, Monmouth Co	Rutsen S. Snyder	New Monmouth, Monmouth Co.
96 Hightstown	Joshua R. Norton	Hightstown, Mercer Co	Miss Ada R. Carnahan	Hightstown, Mercer Co.
97 Clinton	N. S. Wyckoff	Clinton, Hunterdon Co	Martin Frace	Clinton, Hunterdon Co.
98 Allentown	Benj. C. Spaulding	Allentown, Monmouth Co,	Henry R. Taylor	Allentown, Monmouth Co.

CONTENTS.